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Leeds

LECTURES

ON

DIGESTION AND DIET.

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&c.

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1824.

LECTURES

LECT. I. INTRODUCTION TO PHYSIOLOGICAL LECTURES.

FUNCTION OF DIGESTION.

II. DIET.

III. DISORDERS OF THE ALIMENTARY CANAL.



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Edward Baines, Printer, Leeds.

In 1822, I delivered to the Philosophical and Literary Society of Leeds, Seven Elementary Lectures on Physiology, and the next Spring a course of Ten, on the same subject. They were illustrated by specimens, anatomical preparations, and drawings.

From the interest which these Lectures excited, it was expected that they would have been published soon after delivery : but the occupations of general practice have continually retarded my progress.

A cursory survey like the present, suits neither my disposition nor my habits ; and if popular information had not been urgently required, I should have employed myself on a particular investigation, rather than a general range.

These Lectures attempt no display of erudition. Ignorance is not clothed in a learned phraseology, nor supported by a parade of authorities. Even chemical and anatomical details, have been omitted, when the subject did not absolutely require their introduction.

Leeds, Sept. 1, 1824.

LECTURE I.

PHYSIOLOGY has no slight claim on your attention. It is a study pre-eminently calculated to afford advantage to society and individuals,—highly important in its researches, and fraught with useful information even in its simple details. It presents the noblest views of design and combination,—of design, emanating from benevolence, and combination, the work of consummate wisdom.

Look at the Skeleton. You remark the hollow globe at the summit, formed for containing the great centre of nervous energy, feeling, and mind. Below, you see the framework of an admirable structure. You find a multiplicity of joints,—moveable supports,—arms capable of extensive range,—in a word, contrivances numerous, varied, and beautiful, all befitting an animal destined to rove in every region, to acquire his food from different sources, and to communicate with the world around him.

But turn to the more complete exhibition of Physical Man. Examine his mechanism. You find arranged on the framework, Muscles to perform its motions. You remark Nerves distributed to these muscles, maintaining their vital energy, and directing their several actions. To afford stimulus or pabulum to these nerves,—you find a peculiar fluid, impelled by that beautiful instrument, the Heart, and distributed in a circulation ceaseless and universal. To purify the Blood, to diffuse over it the vivifying influence of the atmosphere,—you see the Lungs, and the curious mechanism, which alternately dilates and contracts the chest. Next, you contemplate the Digestive organs, the great system of supply, by which bread and flesh are converted into blood. In the further progress of your examination, you discover a less obvious but scarcely less operative system, the Absorbents, which throw into the Blood, not only its supply, but also the effete parts of the whole body. As a balance to the Absorbents, you notice a large collection of Secretory organs, which both throw out of the Blood its worthless parts, and elaborate from its valuable ingredients, fluids for various uses, especially the materials for building the hourly-decaying fabric. You remark, moreover, a Cellular tissue, which connects the several parts of the body, and, woven in different degrees of density, forms the various membranes. You further examine that curious structure, the Skin; ordained, not only to conceal and protect the internal organs, but to throw off waste fluids, and afford surface for the important sense of touch.

But I must not here descant on the several systems, their combination, and mutual dependence. Suffice it at present to advert to the arrangement of their functions, sometimes vicarious, sometimes in regular succession, sometimes simultaneous, but ever directed by one great principle, resident in the nervous system.

It is this principle, though invisible in form and inscrutable in agency, which is the admiration of the Physiologist and the confidence of the Practitioner. This "Conservative Power of Nature"—this "Vital Influence" protects you from the chemical agencies, which are incessantly destroying inanimate matter. She watched you in the cradle,—formed your expanding organs,—gave to your figure strength, symmetry, and delicacy, and to your countenance the glow of intelligence and beauty. To every period of life, she has given its appropriate constitution : for every evil, she has attempted a remedy. She is the guardian, who attends you by day and by night. She counts the sands of your hour-glass ; and never deserts you, till torn away by an irresistible hand.

Can a subject like this be defective in interest ? Is your own structure,—its elements, organization, and functions,—the only subject to be neglected in the wide field of nature and art ? Can you remark the ordinary phenomena of life, can you feel the beat of the heart, or the heaving of the breath, and care nothing for the operative cause ? Your feelings,—are they not deranged ; your comforts,—are they not suspended, by a slight error in an organ of secretion ? The mind too,—where

is perception, judgment, or imagination, when blood is not propelled through the brain? Change this important fluid; send to the great centre of the nervous system, a purple instead of a scarlet stream, and you sink genius to a level with the worm.—I repeat, then, the question, Can a subject like this, be defective either in interest or instruction?

Say not, that one class of society is engaged in the pursuit; that medical men are the only proper students of Physiology. The advancement, indeed, of the science, is their peculiar duty; they have the best opportunities of observing its phenomena; and their practice is, or ought to be, founded on its principles. But who is to watch over the duties of the profession,—who to ascertain the fidelity and zeal of its individual members? Who scrutinizes their objects? Who estimates their talents, and the application of these talents? Who reviews our ranks, for the detection of the mercenary and inefficient? Who draws the mask from the regular charlatan, and the solemn pretender?

Till the public attention be turned to physiological inquiries, these inquiries will be but coldly conducted. When there is little respect for successful exertion, there will be little inducement to persevere. Were the public at large alive to these important pursuits, medical men would be roused from their torpor. The light of science would then illumine the routine of practice; and Physiology be no longer a mass of conjectures, nor Medicine a farrago of remedies.

Yet objections are made to the dissemination of physiological, and especially of medical information. Knowledge in general, has its opposers and its slanderers. But their efforts are now too late. The night of ignorance is almost past; and the phantom of prejudice, which has chilled intellect and stopped the circulation of knowledge, flits, dwindles, and vanishes at the dawn of day. And while Philosophy is advancing over new regions, and spreading her banner of light on ranks of men, who were yesterday uncivilized hordes;—surely any individual may boldly state what has truth for its basis, and utility for its object,—nor care for divulging the mysteries of Physic.

But, say some, with a degree of plausibility, “A little knowledge is a dangerous thing!” It may be so in poetry. But is the adage applicable to literature and science in general? If a little knowledge be indeed mischievous, what shall we think of any man’s attainments? View the expanse of Science, and say, what an individual has acquired: note accurately the fraction of his possessions. Look again at the field of Physiology, and see the petty proportion, which has been explored: then say, if a little knowledge be so dangerous, whether the medical profession is not dangerous to the community.

But in reference to the human body, its functions and disorders, every one, in fact, pretends to a little knowledge. There is not an individual, from the highest to the lowest class of information, who cannot talk on medicine, and illustrate other subjects by medical

allusions. Yet there is scarcely an individual, unless a member of the profession, who does not commit himself, and few, who are not widely, nay ludicrously in error.

All knowledge must at first be little. Minerva, indeed, we are told, sprung from the brain of Jupiter in the fulness of her wisdom and strength. But that was in the golden age. We of this iron or leaden generation, can hope for no such felicity. We must be content to crawl like the infant, before we walk like the man.

“A little knowledge is a dangerous thing.” This indeed should be the motto of those, who profess a particular acquaintance with the structure and the disorders of the human frame; and well would it be for society, if it roused us to increased exertion. Reflecting on the extent of knowledge, which our vocation demands, we should be incessantly on the advance; sensible of the interests dependant on its application, we should be intently vigilant, and habitually accurate. But neither the same accuracy, nor the same extent of knowledge is required by persons not of the profession. They may know enough for the purposes of general science, for the preservation of health, for the temporary treatment of urgent diseases and accidents,—enough, moreover, for discriminating the merits and demerits of those, to whom they commit their lives and the lives of their families,—they may know this at least, without sacrificing their whole time to the study. And I cannot suppose, that any sensible medical man would check the dissemina-

tion of physiological knowledge, by repeating an adage, which at best is of doubtful truth, and which, as applied to science, suits only the dark ages, or interested individuals.

Will any one tell me, that I must not have even a little knowledge of myself, my structure, the causes of my varying feelings and disorders? Just as soon shall he teach me to forego an acquaintance with my own house, its apartments, furniture, and arrangements.

My object in these Lectures, is to give a general, but not incorrect sketch of Physiology,—to diffuse useful information in a popular form. I have therefore endeavoured to make the language as plain, and the illustrations as intelligible, as possible. The Lectures will not be found a mere compilation. Most of the facts and doctrines have been matter of reflection, and not a few, of direct experiment. The deeper researches of Physiology are precluded by the nature and limits of the course. Nor will disputed doctrines be mentioned, unless they seem of particular importance. I shall endeavour to explain, not what we doubt or deny, but what we know or believe.

The examination of functions has naturally led me to notices of disorders. Hence I have briefly adverted to the principal diseases, their causes, and sometimes also, the means of prevention.

To these notices, I had added a sketch of the medical treatment; but this, except in a few instances, has since been erased; not because the subject is either useless or improper, but because the number and length of the Lectures, would have required more time than I can spare, and more patience than an audience, even as attentive as my last, would readily give. The medical subjects, which have been retained, are those on which popular information seems particularly required.

DIGESTION.

I commence with **DIGESTION**,—a subject perhaps the least attractive in the course. The first Lecture will be chiefly descriptive.

Digestion may be conveniently introduced by a slight familiar sketch of the process.

Food received into the mouth is triturated by the Teeth, and mixed with the Saliva. The pulp, thus formed, is propelled in successive portions into the Gullet, and thence into the Stomach. The action of this organ mingles its parts more intimately than before, and adds a liquor, which has the principal solvent power. Passing, after a time, through the inferior opening of the Stomach, it enters the Intestines; and soon meets with the Bile and Pancreatic juice, two other fluids assisting in digestion. As the food, mixed with these several solvents, and changed by their

peculiar agency, proceeds along the canal, its valuable parts are absorbed by little vessels, which open their mouths on the inner surface of the intestines, and carry the nutriment to a duct or pipe, whence it is conveyed into one of the veins, and mixed with the blood.

From this bald outline, we proceed to examine the function of Digestion in detail. The Alimentary Canal (a term, which I shall often have occasion to use,) consists of the mouth, throat, gullet, stomach, and intestines: it is, of course, the track which the food takes. The Teeth, the first organs employed, are too well known to require description. I would only remark, that, in man, they are evidently destined to cut, to tear, and to grind the food.

This division of the food is one process performed in the mouth; the addition of Saliva is another. The Glands which elaborate this fluid are placed in the neighbourhood,—at the root of the tongue, under the lower jaw, and before the ear. The action of the several muscles employed in mastication, stimulates these organs, and squeezes the saliva from their ducts: and thus an increased quantity is thrown out, during the comminution of the food. The effect is not, however, to be attributed solely to mechanical impulse. Impressions on the nervous system have a remarkable influence on the secretion. The excitement of the nerves of taste, by the qualities of the food, augments the action of the glands; and we find an increased flow of saliva even on the sight of agreeable food.

After due mastication, and the free effusion of saliva, the tongue places on its back the pulpy mass, and, contracting on its base, projects the load into the Pharynx,—the principal cavity of the throat, or, as it may be considered in the present discussion, an expansion of the common alimentary tube. At the time that the tongue propels the mass of food, the muscles elevate and enlarge the pharynx; as the mouth of a corn-sack is held for the reception of grain.

There are four openings into the pharynx:—the 1st, that which communicates with the mouth; the 2d, that which communicates with the nostrils; the 3d, that of the glottis, which opens on it from the air-tube; and the 4th, the Œsophagus or Gullet, the continuation of the alimentary canal to the stomach. It is apparent that in deglutition, the food must be wholly excluded the three first, and enter only the gullet. Accordingly we find, when the tongue casts it from the mouth, the passage to the nostrils is closed by a fleshy curtain, which, hanging from the palate, is carried backwards and upwards, by the action of appropriate muscles and the pressure of the descending food; while the entrance to the air-tube is covered by a curious little lid, which the tongue forces at the same time on the glottis.* These structures are peculiarly beautiful, and well deserving your attention.†

* From the experiments of Majendie, it appears that the Epiglottis is not *essential* to deglutition; for the Muscles which elevate the Larynx, bring into contact the edges of the Glottis. Yet the case by Baron Larrey, which will be noticed in the third Lecture, seems to militate against this opinion.

† They are easily examined in a slaughtered animal.

The pharynx, and the parts which bound it, have a high degree of sensibility. The tickling of a feather is well known to induce a convulsive action of the muscles of deglutition, and even of the diaphragm. Yet Majendie quotes the case of a Jew, who was able to double his tongue backwards, and plunge it with the greatest ease into the pharynx,—and of a child, who acquired the same power by imitating the Jew. This singular relation exhibits the influence of repetition and habit; not only in giving to muscles a preternatural facility and extent of motion, but also in diminishing the sensibility of parts, accustomed to act on the slightest irritation.

The Gullet is situated behind the air-tube, and commences from the lowest portion of the pharynx. Its internal surface is formed by a dense membrane; but the rest of the structure is almost entirely muscular, consisting of two planes of fibres, one circular, the other longitudinal. The ball of food, on entering the gullet, stimulates its muscles; and by their action,—one plane shortening the canal, and the other lessening its diameter,—the food is propelled, by successive contractions, into the stomach.

This cavity is of peculiar figure. It is generally compared to the pouch of a bagpipe. The larger end which receives the termination of the gullet, is called Cadiac; the other extremity, opening into the intestines, is denominated Pyloric. This name is derived from a band of muscular fibres, which, with a doubling of the inner coat of the stomach, forms a valve—pylorus, a door-keeper. The stomach is composed of three principal coats;

the outer, a reflection of the peritoneum—a membrane common to most of the contents of the abdomen; and connecting them to each other and to the spine;—the middle, composed of muscular fibres, which, radiated in various directions, perform the motions of the organ;—and the inner or villous, formed of a multitude of velvet-like eminences, and moistened with mucus. The *external* coat requires no particular notice. But the *middle* has interesting functions. By the contraction of this tunic, the Stomach is accommodated to the quantity of food it contains, and no considerable vacuum allowed, even when the organ is empty. The ordinary motions of the Stomach are called *peristaltic* or *vermicular*. They are produced by the successive actions of the several bands of muscular fibre, which slowly propel the contents of the cavity towards the Pylorus. These worm-like motions are seen immediately after the death of a healthy animal.

The *inner* or *Villous* coat of the Stomach is an important structure. It is thicker and more pulpy than the others. After death by violence, it presents numerous wrinkles,—the effect of the final and strong contraction of the muscular tunic, with which it is surrounded. When viewed with a small magnifying power, the villous coat has the appearance of pumice-stone. It has numerous excavations, called Follicles, of various figures and variously arranged, and which have been particularly delineated by Sir Everard Home. Their use appears to be the separation of certain fluids from the Blood. In the structure of the villous coat, we find also branches of *arteries*, to carry

blood to the Follicles, as well as for the other functions of the Stomach,—*veins*, to bring back the superfluous or impure blood,—*absorbents*, to take up some fluids from the food, as well as the waste parts of the Stomach itself,—and *nerves*, to afford vitality. This supply of vessels and nerves is, in fact, common to all organs: it is essential to the character of an organized structure.

On opening the Stomach, we find a slimy and greyish fluid, termed Gastric Juice. This has been the subject of much discussion, and of some interesting experiments. What are its nature and properties? It appears to be a compound fluid. Mucus freely effused in every part of the alimentary canal, is one of its constituents: the Saliva, swallowed with the food, must form another. But the remarkable organization of the inner coat of the Stomach, forbids us to rank it as a mere mucous membrane; and the peculiar agency of the gastric fluid, claims for it a superiority to Saliva. The well-known experiments of Spallanzani, inform us, that juice, taken from the Stomach of an animal and kept at the natural temperature, dissolves flesh. The doubt, which has since been cast on the correctness of his statements,* led me to make some experiments.

Without entering into detail, I may remark that there is an evident solvent power, both in saliva and gastric juice, even out of the body: but this power considerably greater in the last.

* Montegre maintains that the Gastric Juice is nothing more than Saliva, or Saliva mixed with an unctuous matter and a little vapour.

If like portions of flesh be subjected to these respective fluids, that in the vessel of gastric juice will be more dissolved than the other. The disparity we once found as nine to six; but generally the proportion is greater.*

One of the most remarkable operations in the Stomach, is the coagulation of Milk. Gastric juice, out of the stomach, instantly produces the same effect,† while the influence of Saliva scarcely exceeds that of simple water.

Equally marked is the superiority of gastric juice in the solution of bone. We have found one-sixth dissolved in five hours; while contrasted experiments with saliva, exhibited no considerable change.

These remarks tend to establish the rank of Gastric juice as a peculiar solvent, and prepare us for

* Since the publication of the work of Fordyce, it has been stated in all the systematic works I have seen, that the Gastric Juice corrects putrefaction,—that fetid meat, taken into the Stomach, soon becomes perfectly sweet.

Fordyce expresses himself in the following words: “If meat be exhibited to a Dog, which is already fetid and tender from putrefaction, and the Dog be killed in half or three-quarters of an hour afterwards, and the meat of the Stomach examined, it is found firmer and free from fætor.”

1824, Jan.—I found in the Stomach of a Cat, putrid meat, which had been eaten long before,—probably seven hours. I requested my Pupil, Mr. Horton, to give to a Cat, which had been without food since the preceding day, a piece of flesh, as putrid as could be procured at this season of the year. An hour afterwards, on examining the contents of the Stomach, we found the fætor increased rather than diminished. To a Dog was given a piece of meat, decidedly putrid. After three quarters of an hour, he was pithed, and the Stomach opened. The fætor of the meat was not diminished in the slightest degree.

The discordance in the observations of Fordyce and myself, may arise from a circumstance, which I remarked in another experiment. When the Stomach is opened immediately after death, the rising halitus diffuses so strong an animal odour, as wholly to cover that of the food. Hence, in a hasty notice, no fætor is perceived, even when the flesh, on a closer examination, or on its removal from the Stomach, is found extremely offensive.

† White of Egg is also coagulated; but I have remarked the process to be much slower, and much less perfect.

observing its action in the living Stomach. But at present, I need only observe, that its properties are still more remarkably exhibited in the regular process of Digestion,—a vast variety of vegetable as well as animal substances converted to chyme,—some fluids coagulated and many speedily changed in their qualities,—Shells and Bones dissolved. There have been several instances of Horn reduced in the human Stomach. One frequently referred to, is that of a sailor in Guy's Hospital, who died from inflammation of the bowels, produced by swallowing pocket knives. With this strange practice, he had occasionally amused his comrades, for the preceding ten years. Some of the knives he had voided in parts, or in a half digested state ; while others, it appears, were retained altogether. On inspecting his corpse, the cause of the fatal inflammation was found in a blade, stuck across the intestine. No trace existed of the haft, to which it had been fixed. The horn or bone must have been completely dissolved in the alimentary canal ; and no doubt by the agency of the Gastric Juice.

After death, this fluid has destroyed even portions of the stomach ; and sometimes also the adjacent parts, as the spleen, diaphragm, and lungs. In persons who die in full health, this is by no means infrequent. A robust man is killed by a blow. The gastric juice, freely secreted up to the moment of death, continues to act, though its source of supply be destroyed. It seizes, of course, the nearest dead animal matter ; and thus the stomach itself, now devoid of life, is dissolved by the very fluid, which it before secreted. This curious

circumstance rarely occurs after death from lingering disease; as the gastric juice, in common with other secretions, is reduced both in quantity and power. But I once found holes in the stomach of a child, who died from hydrocephalus. I believe, however, that the appetite had been good, even to the last.

Erosions in the stomach may also be produced by arsenic; and the effects of natural death may have been mistaken for those of poison.—Unhappily, the distinctive marks have not been accurately stated, or at least are not sufficiently known to the profession.

A Miss Burns, of Liverpool, died of severe vomiting and diarrhæa; and Mr. Angus was suspected of having administered some noxious drug. On examining the body, the medical practitioners found holes in the stomach, but yet no traces of poison. The major part of them, believing the erosions præternatural, gave evidence at Lancaster, tending to criminate Mr. Angus. One, however, maintained an opposite opinion, endeavouring to prove these holes the effect merely of the gastric juice. Mr. Angus was acquitted.

In the midst of a solvent so powerful as the gastric juice, we should not expect that any creature can live. But the fact is related of a lizard, found alive in the stomach two days after it had been swallowed. Nay, it appears that some of the lower classes, may not only live, but even acquire an enormous bulk. This is sometimes the case with the leech accidentally swallowed. In an instance related in the Edinburgh Medical Essays, two of these creatures

had been received into the stomach, and caused little irritation till the patient was engaged in a duel, and received the point of a sword in his breast. After several weeks of annoyance, the leeches were discharged by the bowels; and it was found, that the least of them measured one foot and a half in length, and one inch and a half in diameter. The eggs of the spider have been hatched or perfected in the stomach. We even find that the kernels of the cherry and plum have germinated in this cavity! On reflection, these statements are not so marvellous as at first they appear. They form no exception to the doctrine of gastric solution. They exhibit only the wonderful agency of life in resisting the most powerful solvent; and therefore so far from impugning, they establish the principles, which I have endeavoured to illustrate.

To return to the process of Digestion. From the figure and structure of the stomach, we should infer that the food is destined to remain for some time under its influence; and in fact we find gastric digestion to occupy from two to four hours. Soon after a meal, the two openings of the stomach are closed.* There is then an increased action of the arteries and nerves; the former transmitting a copious supply of scarlet blood to the villous coat,—the latter, of vital energy, both for converting this blood into

* Magendie states that the pyloric orifice is always shut; while a curious action of the Gullet, an alternating motion of its fibres, prevents regurgitation from the cardiac.

gastric juice, and for augmenting the power of the muscular tunic. Next we find the absorbents excited ; at least a quantity of fluid disappears from the gastric contents. Meanwhile, the solvent juice is gradually effused from the inner coat of the stomach, and acts on the solid aliment, with which it is in contact. As the secretion becomes more copious, the centre of the food is at length pervaded, and every part of a moderate meal is moistened with the important fluid. It is nevertheless apparent, that the aliment in immediate contact with the stomach, will be most dissolved. To move this onwards to the pylorus, and thus make way for that which is less affected, the fibres of the muscular coat* are thrown into successive action,—the peristaltic or vermicular motion is produced.†

Corresponding with the diversities of structure manifest in the stomach, we may fairly suppose diver-

* From the observations of Sir E. Home, it appears that the stomach in some animals is divided, during digestion, into two pouches. In man also, this circumstance is supposed to occur.

† Dr. Philip has adduced the result of numerous observations on the process of digestion in Rabbits. But as the organs and the food of these animals do not closely resemble those of Man, I have made several remarks on the function in Dogs and Cats. A summary will render details unnecessary.

1. In the early stage of digestion, a change is found in that part only, which is in contact with the villous coat ; but in the more advanced, the gastric juice generally pervades the whole mass, and the central part is consequently affected.

2. In mixed food, it does not appear that certain parts are moved to the pylorus sooner than others.

3. Where there are any remains of a former meal, these are found near the pylorus,—distinct from the recent food, of a darker colour, and (in the animals to which I now refer) mixed with hair.

4. If three meals be given at short intervals, the first, as we should expect, occupies the pyloric extremity ; the 2d, principally the great curvature or cardia ; and the last is laid on the former, and extends on the small curvature. But to this general observation, there are occasional exceptions. A small portion

sities of function ; but these have not been distinctly ascertained.

It appears, however, from several facts, that the cardiac extremity is the most important in Digestion. Dr. Wilson Philip states, that Mr. Hastings, on examining the stomach of a woman, who had died under his care, found ulceration of every part, except the cardia ; yet there was evidence of the food's being properly digested, even to the last.

After the elaboration of the food, the longitudinal fibres of the muscular coat bring the lower aperture of the stomach into a line favouring the transmission of the gastric product. But before it can enter the intestines, it must necessarily pass the Pylorus. The office of this door-keeper is not a sinecure. He must examine the qualifications of every applicant, and allow those only, that are in a suitable state, to pass his portal. Accordingly, the muscular ring contracting, drives back all undigested matter, and compels it to perform again the round of the stomach. It appears, however, that the pylorus, like other officers, may by repeated solicitation be induced to transgress his orders ; for clasp-knives, (as in the instance which I lately mentioned,) half-pence, and I believe also pence and crowns, have been sent through the aperture. It is related that Vaillant, when pursued by corsairs, swal-

of one meal is sometimes found in the centre of another ; and fat especially, is seen in the cardia, when the flesh with which it was eaten, has been moved to the pylorus.

5. The state of the villous coat and its secretion, varies considerably. The rosy hue is rarely universal, and generally absent altogether. The moisture of the coat is sometimes greatest in its cardiac portion, sometimes in the pyloric : but I have thought the latter has more mucus, and the former more of the solvent fluid.

lowed twenty valuable gold medals, which at length passed the canal; and that he even sold one of them by anticipation, before it had made its appearance. Several substances also, difficult of solution, but harmless either from their nature or size, are permitted to pass; sometimes indeed are early thrown into the intestines, in order, as it would seem, that the stomach might employ its energies on food more soluble or nutritious.

The preceding details apply to the first, or Gastric Digestion. Before I proceed to the second or Intestinal, I must briefly describe the structure and connections of the organs it employs.

The intestines are remarkably voluminous, equaling five or six times the height of the man, and of nearly twice the proportionate length in the infant. This elongation of the canal prevents the too rapid transmission of the aliment, and it is still more important as affording ample surface for absorption. The intestines are so coiled together as to be with difficulty unraveled. This is rendered necessary by their length, and the comparatively small space they occupy. They hang loose in the abdomen, yet are attached to the spine by folds of membrane.*

* This, termed Peritoneum, lines the cavity of the abdomen, as well as covers the intestines individually. It is a *reflected membrane*, an arrangement scarcely to be understood by verbal description, and not necessary to our present subject. The folds of the close portion constitute the Mesentery. Between them run the nerves and vessels, (I would especially mention the Lacteals), requisite to the important functions of the intestines. The Omentum or Caul is placed, like an apron, over the intestines. In general, it is a delicate and beautiful structure, but in fat persons it is usually much thickened.

The first of these provisions allows the variation in the diameter of the canal, which digestion produces: the second, prevents too great a displacement from posture or violent exertion.

The intestines are divided by anatomists into six, but the only natural distinction is that of *large* and *small*.* The intestinal tube is formed, like the stomach, of three principal coats; the external, the close portion of the peritoneum; the middle, two planes of muscular fibres;—the internal, villous, or downy in the small intestines,—mucous, in the large.

The villous coat of the small intestines is a beautiful structure. Like its continuation in the stomach, it is composed of papillæ, and fully organized; and like the inner coat of the stomach too, it has numerous folds (*valvulæ conniventes*); but these are plaits, not wrinkles, and consequently much larger; they are transverse and permanent. This arrangement extends the surface for the action of vessels, and prevents too rapid a descent of the food. On the villous coat, is seen a considerable but varying quantity of fluid.† This in common seems to be principally mucus; but serum, thrown out by the exhalents, sometimes forms a considerable proportion, and often in a state of purgation, by far the greatest.

Connected with the intestines are the Liver, Pancreas or Sweetbread, and the Spleen; from the two first

* The Valvula Ilii, placed at the termination of the small Intestines, prevents regurgitation from the large.

† Some Physiologists mention the Intestinal Juice, as fixing the nutritious parts of the dissolved aliment, preparatory to their absorption in the form of Chyle.

of which are ducts or pipes, opening into the upper part of the canal, and conveying Bile and Pancreatic juice. The particular agency of these secretions has not been discovered. Their sources have long been known; the mode of their transmission to the alimentary canal is also apparent; they have been subjected to chemical analysis; but their natural operation is little elucidated. In reference to the bile, however, we believe that it has an action in the formation or separation of the chyle; that it is a powerful stimulus to the peristaltic action; and, from some experiments of Sir Everard Home and Mr. Brande, we may ascribe to it another, and more specific function,—that of forming Fat. Mr. Brande found this substance produced out of the body by adding bile to muscle, and keeping them four days at the temperature of 100° . It appears from the observations of Sir E. Home, that the formation of fat takes place in the large intestines;—and not on the first admixture of bile.*

Of the Spleen, less is known than of any part of the digestive apparatus. We find it a spongy and highly vascular structure; and recent microscopical observations have exhibited the form and contents of its corpuscles. Its appearance is decidedly glandular; but it has no excretory duct. This remarkable circumstance proves its office to differ from that of the common organs of secretion. *but I don't think so*

The spleen, it appears, is not necessary to the animal economy. It may be cut from the body of a

* Two recent cases in practice lead me to think that Fat is sometimes formed in the disordered stomach.

dog, without manifest injury to his health. We learn also, that a man may live without his spleen, though the consequences of its loss have not been satisfactorily stated. The size of the spleen varies with the state of digestion. Sir E. Home found, that the spleen of an ass, taken two hours after the animal had drunk freely, was twice the size of another, taken from an ass, which had fasted two days.

From this cursory survey of the bowels, and their several functions, I revert to the digestive operation. The alimentary mass, after it has undergone the agency of the stomach, is reduced to a thick fluid, varying in colour, but generally brown or gray.* Marcet states albumen to be contained in this fluid;—an interesting fact, as it exhibits the wonderful agency of the stomach in converting food into a substance, of which before it gave no trace. The product of gastric digestion, ejected through the pylorus, is gradually transmitted through the convolutions of the intestines. But soon after it has left the stomach, it receives the Bile and Pancreatic juices, as well as some fluids from the villous coat of the intestines. Mixed with these secretions, and subjected to their peculiar operation, it acquires a disposition to separate its nutritious particles. Accordingly, we find the valuable parts close to the intestines, while the waste are loose in the middle of the canal. The mass is forwarded by the action of the muscular coat,—the reiterated, alternate, yet apparently irregular contractions of the circular and longitudinal fibres.

* Termed Chyme;—but I avoid the word, from its close resemblance to chyle, and the mistake which might hence result.

Besides this agency, the peristaltic motion contributes to the free distribution of blood. The vessels of the intestines, excited by the contractions of the muscular coat, become so turgid as almost to assume the blush of inflammation: and when we consider the activity of the glands and exhalents during the process of digestion, we see a necessity for a plentiful supply of that fluid, whence every secretion is formed.

The absorbents of the intestines seem to have peculiar functions. From their colour, when distended, they are called Lacteals. They are a multitude of hair-like pipes, which running between the layers of the mesentery, open their mouths in the cavity of the bowels, and take up the nutriment, in the form of chyle.

The contents of the small intestines are thin;—those of the large much more dense. Here, therefore, it is apparent that the watery parts are absorbed;—but whether any chyle is naturally taken up by the large intestines, has been doubted. My pupils and myself have seen it in the Horse. A soldier, soon after eating a plentiful meal, was killed by a musket-ball,—which, entering the chest, compressed the Thoracic duct, and thus prevented the ascent of the chyle. Dr. Schwenke, on opening the body, found the mesocolon (the mesentery of a large intestine) interspersed with numerous and well-filled Lacteals. From the experiments lately noticed, the large intestines seem to be of use also as a laboratory for the formation of fat.

The excrementitious matter in the large intestines is not the mere residue of food. The effete parts of the body form a considerable proportion,—sometimes by

far the greatest. Hence, after fevers and other diseases, cathartics produce large evacuations, though scarcely a particle of food has been taken for weeks.

In stating the functions of the alimentary canal, I must notice the formation of Gas; though this subject has been but partially investigated.*

My general description of the Digestive process, shall be concluded by some notices of the Chyle, and its transmission to the Bloodvessels. Chyle is a fluid resembling milk. Its nature and properties have not been fully developed. I therefore merely state, that it wholly differs from the food,—that it contains a large proportion of albumen,—and that it approaches, except in colour, to the character of blood. Like the blood, it loses its fluidity, when removed from its living vessels: like the blood, it separates into serum, coagulum, and globules. The sole object of Digestion, you bear in mind, is to make this important fluid. Food is first changed by the Saliva; mixed with the Gastric Juice, it becomes albuminous; subjected to the Bile and fluid of the Pancreas, it throws out particles like the lymph of the blood; finally, these particles, taken up by the Lacteals, appear to be Blood in every thing but colour.

The Lacteals join to form a common receptacle. This reservoir communicates with a vein in the neck,

* Magendie and Chevreul, on examining the alimentary canal of four criminals, executed at Paris, found eleven per cent. oxygen in the gaseous contents of the stomach, but none in the intestines. These contained azote, in large proportions,—carbonic acid, in more considerable quantities than in the contents of the stomach,—hydrogen, chiefly in the small intestines,—and carburetted hydrogen only in the large.

By means of a tortuous pipe, the Thoracic duct, which creeps up the anterior part of the Spine. The Chyle, after its transmission, drop by drop, into the subclavian vein, is mixed with the Blood, carried to the Heart, and impelled through those rounds, which the vital stream must incessantly perform. In its course, it is necessarily subjected to the action of the Lungs, where probably sanguification is completed.

Such is the complicated process, which converts *solid aliments* into blood. It is apparent that the *fluids* we drink, must also enter into the sanguineous current. How are they transmitted? The rapid effect on the kidneys, of gin, oil of turpentine, and even tea, warrants the supposition of another and a nearer route, than that of the intestines, lacteals, and thoracic duct. Without adverting to the hypothesis of Darwin, on the retrograde action of the absorbents, I may urge the remark before made, that fluids disappear from the stomach, without entering the intestines.* For further detail, I refer to the experiments of Magendie and Sir E. Home, which fully establish the fact, though they do not develop the course of the liquids so quickly and copiously imbibed.†

But whatever may be the route of the *fluid* ingesta, whatever digestive change they undergo,—the elabo-

* To a small dog was given a measured quantity of water, and after fifteen minutes, the stomach examined.—We found little more than one-fourth of the fluid; though it was evident that none had passed into the intestines. Fluids vanish as rapidly when the communication with the intestines is cut off by ligature.

† From his experiments, Sir E. Home at first conceived the Spleen to be the organ of transmission; but a more full and close examination convinced him, that this part of his inference was erroneous. The spleen of a dog was

ration, the circuitous and varied track of the *solid* is satisfactorily proved.

How then is Food converted into Chyle? We have examined the apparatus, and seen some of its effects. But what is the *nature* of digestion? On this subject, theories have been held by the learned, which observation and reflection readily overturn.

Many of the ancients, and not a few authors comparatively modern, have ascribed digestion to *heat* and *fermentation*.

Heat seems to assist in the solution of food. Flesh, after remaining a short time in the stomach, has the appearance of that which has been parboiled. And experiment proves gastric juice, out of the body, to effect a greater change at the animal temperature, than when the heat is only that of the atmosphere.* But these remarks, it is obvious, exhibit

removed; and four days after, the thoracic duct tied. Three ounces of infusion of rhubarb were then injected into the stomach; and in an hour and a half, the animal was killed. The urine was found strongly impregnated with rhubarb. The result was similar, when not only the thoracic duct was secured, but also the lymphatic trunk of the right side. The chyle in the thoracic duct was tested in several of these experiments, but never exhibited the presence of rhubarb. How did the rhubarb reach the kidney? The alimentary canal has no known communication with this organ; and the supposed course of fluids was stopped by ligatures. Magendie's experiments resemble Home's in their result.

* Two equal pieces of flesh were subjected for four hours to canine gastric juice,—one portion at the temperature of the atmosphere, 60°,—another at the heat of 98—100°. We found the first to have lost scarcely one-thirtieth of its weight,—the second, nearly one-sixth.

While digestion in cold-blooded creatures proves that heat is not the grand agent, its comparative vigour in different temperatures, proves heat to have a considerable influence. The Snake has been found to digest its food faster in June than in April. In summer, Polypt are stated to digest in twelve hours, what in colder weather would require a period of three days. In the Hedgehog, the function is not performed during winter. The effect of temperature on this

heat merely as an auxiliary.—Numerous facts, too familiar for detail, shew that a temperature of 98° will not convert bread or flesh into chyle: and, on the other hand, we find digestion performed when the temperature is considerably lower, as in tortoises, serpents, and fish.

Fermentation? The products of fermentation are wholly different from those of digestion. The stomach forms neither wine nor vinegar. Even the acid, which sometimes rises in the throat, is generated only when the healthy function is suspended.

Is digestion a process of *putrefaction*? No fact, no observation, with which I am acquainted, favours such an opinion. And although experiment proves that putrid meat is not rendered sweet in the stomach, observation by no means shews, that sound flesh is rendered fetid.

Some physiologists have ascribed the function to *trituration*. They tell us that food is pressed, not only by the muscular coat of the stomach, but by the respiratory organs, in constant action, and by the adjacent arteries, which pulsate 4 or 5000 times an hour. Nay, they refer us to the stomachs of certain animals, and particularly to the gizzards of birds. In these we admit trituration to have a considerable effect: but the reason is obvious. These creatures are not

animal is shewn in a more marked manner by an experiment of Hunter's. Mr. Jenner found that "the hedgehog, while the heat of the stomach was at 30° , had neither desire for food, nor power of digesting it; but when increased by inflammation in the abdomen to 93° , the animal seized a toad which happened to be in the room; and upon being offered some bread and milk, it immediately ate it. The heat roused up the actions of the animal œconomy; and the parts being unable to carry on these actions without being supplied with nourishment, the stomach was stimulated to digest, to afford them that supply."

provided with teeth, and have, therefore, no other apparatus for breaking the food. And it should be remembered that this process, even in birds, is not digestion, but merely a preparative to digestion,—an action which renders the food capable of being affected by the animal fluids.

In the higher classes, daily observation shews the improbability of this opinion. You see the dog swallow splinters of bone; yet his stomach is as thin and tender as that of man. Fatal laceration would ensue, if it were subjected to one-tenth of that enormous pressure, which some physiologists have supposed.* In the human subject, the experiments of Reaumur, Spallanzani, and Stevens, often quoted by systematic writers, prove that digestion is not the work of trituration. A poor fellow, at Edinburgh, was hired by Dr. Stevens to swallow a perforated ivory globe, filled with meat. The globe was voided nearly empty. Here, then, the pressure must have been received on the globe, without affecting its contents; yet the meat had been dissolved by the gastric juice, and formed into chyle. Trituration, moreover, cannot alter the essential character of matter. Each piece of bread, each grain of seed, however bruised or comminuted, is still bread, is still corn. The action of the muscular coat, therefore, can only be auxiliary to the process of digestion; and, in man, chiefly valuable, as subjecting the food to the gastric juice.

* Borelli estimated the pressure, which the stomach and respiratory muscles exert on the food, at 261,186 pounds;—thus placing “the power of 20 mill-stones in a man’s stomach.” Wainwright and Pitcairn were little less extravagant.

What then is digestion? It is evidently a change, produced by certain animal fluids. Is this agency merely chemical? Will these fluids, out of the body, perform their peculiar functions? No. Gastric juice and saliva, in a glass or earthen vessel, manifest, indeed, considerable solvent powers, but certainly inferior to those evinced in their natural receptacles. The quantity of flesh dissolved is comparatively small; nor can we, by the repeated additions of saliva and gastric juice, completely reduce a small piece of flesh;—we cannot fairly effect in a pot, what is daily performed in the living stomach. Neither can the artificial, be identified with the natural product.* But carry the experiment further. Let flesh be subjected to all the digestive fluids, yet, out of the living vessels no chyle will be formed,—nothing resembling chyle either in colour or character.†

It may excite surprise, that the saliva, the bile, the gastric and pancreatic juices, should not be as powerful in a retort as in the alimentary canal. But

* Beef, mixed with saliva by mastication, was immersed in gastric juice taken from a dog, and a temperature of 98° maintained for nine hours. The flesh was much altered in appearance, and considerably softened, but the precipitate could not fairly be termed *chyme*. It differed in hue, and was full of fibrous particles.

† Though perhaps scarcely necessary to the argument, I may remark further, that the digestive organs act differently according to the nature of the aliment submitted to their operation; and that omnivorous creatures, in particular, have a power of forming respectively, fluids to dissolve vegetables, and fluids to dissolve flesh. Thus the gastric juice of the Sheep is stated to be materially different from that of the Hawk; and the solvent liquors even of the same animal, vary with the food on which he is fed. Dumas remarks, that the gastric juice of a Dog, fed on flesh, is alkaline,—fed on vegetables, is acid. Though there are frequent exceptions, the observation, I believe, will be found generally correct. If, then, the digestive fluids vary, they must be specifically secreted; and this, of course, is a vital operation.

an analogous circumstance may be found in the parent of these secretions. Blood in its natural vessels, and blood in a vessel of earth, are different substances ;—in the former, a liquid,—in the latter, coagulated. Nay, blood in a living artery maintains its properties, but loses them, if this artery be deprived of life : in the former case, it is a fluid ; in the latter, a solid. Thus the juices of the stomach and bowels preserve their characteristic properties, while in their natural state, but removed from their living vessels, can no more generate chyle, than caked blood can form a secretion.

Nor is chyle produced, even in the natural organs, if the nervous influence be withdrawn. Divide the nerves, which supply the stomach, and its functions cease : no gastric juice is secreted, and the aliment, of course, remains without change.*

Digestion, then, though it effects a decomposition of our food, and a recombination of its parts, is not a common chemical process. The stomach is a laboratory, which art cannot imitate. Its operations are governed by peculiar laws, as yet but partially developed,—laws depending on that influence, which distinguishes animated from lifeless matter. Digestion is a vital operation. This is evident from all its phenomena. I might refer to the obvious determination of the vital powers to the organs of digestion. The arteries of the stomach and intestines act with increased

* The experiments on the division of the eight pair of nerves, by Philip, Brodie, Magendie, and others, though highly interesting, have not as yet established results sufficiently consistent and decisive.

energy ; the muscular tunic is irritable ; the sensibility of the whole apparatus is augmented. While, from this determination to the internal organs, a general shivering is often felt, and the skin, in persons of delicate health, is pale and contracted. You remark, also, the drowsiness, which succeeds to a full meal, and the inaptitude of the senses to receive impressions. The dog retires to his kennel, and man lolls in his chair, indisposed for muscular, and incapable of intellectual exertion.

The Cause of HUNGER is a subject of inquiry. As such I shall first recount its phenomena :—a painful sensation at the pit of the stomach,—weakness,—an increased sensibility to cold,—morbid irritability of the system, succeeded, if food be long withheld, by a strong inclination for sleep.

Hunger is increased by cold,—by stimuli to the stomach, as bitters and acids,—by mechanical stimuli. Dr. Percival, of Dublin, relates the instance of a madman, whose appetite was remarkably voracious. Nevertheless the wretched patient “sunk rapidly into emaciation and torpor,” and his appearance resembled a corpse, for several days before death. On the dissection of the abdomen, the stomach was found to contain a compacted mass of hay and straw, larger than an orange. This had not been the least affected by the gastric fluids, though it had been lodged in the stomach more than a month.

Hunger is suspended by the external compression

of the stomach. A tight girdle seems to give new energy to the exhausted traveller. It is reduced by heat. The inhabitants of warm climates take much less nutriment than those of cold.* It is suspended by narcotics. This is commonly experienced by those who take opium and spirits, which first impair, and finally destroy the appetite.† Emotions affect the sensation of hunger. Van Helmont, with a good appetite, going to dine with a friend, received an injury which dislocated his ankle. His appetite immediately forsook him: but as soon as the bone was replaced, his hunger returned. The suspension of appetite was not the effect of bodily impression; for the pain continued some time after the operation, consequently when the appetite was fully re-established. Deep thought suspends the operation of hunger. The story of Sir Isaac Newton's dinner is well known.

It is curious that mastication should relieve hunger. A gentleman chewed lead with this effect; and sailors, for the same purpose, roll bullets in the mouth.

Finally, hunger is removed immediately on taking food; a fact, which, though quite familiar, must be particularly noticed.

* It appears, from Dumas' experiments on dogs, that a draught of cold water appeases hunger, and prolongs the power of abstinence. Would not warm water have a similar effect? Is not the reduction of hunger produced by the distension of the stomach, and the dilution of the gastric juice?

† The observation applies also to tobacco. The late Dr. Whitaker, of Blackburn, mentioned, some years ago, his being solicited by a poor parishioner for alms. The Doctor, on asking what the man bought with his last pence, was answered, "Roll-tobacco;" and on surprise being expressed at conduct so improvident, the man answered, he could subsist longer on tobacco than on bread. To speak more correctly, the narcotic removed the sensation of hunger.

The deductions, which these considerations present, shall be compressed into as few words as possible. Hunger, in common with all sensations, is immediately dependent on the nerves. But the question is, What gives the primary impression to the nerves of the stomach? Various hypotheses have been offered, but the present state of our knowledge scarcely warrants the adoption of any. The most probable opinion is that which ascribes it to the gastric juice. This fluid, of powerful character, is constantly secreted. During digestion it is mixed with the food; but after the cessation of this process, the juice is accumulated on the sensible surface of the stomach, which it peculiarly irritates.

This theory, may perhaps account, for most of the phenomena. The cold to the skin increases hunger, by diminishing the secretions on the surface, and thus augmenting those of the internal organs,—consequently those of the stomach. Stimuli, as bitters and acids, can improve the appetite, only by augmenting or amending the secretion of gastric juice. The compression of the stomach, suspends hunger; as great and continued pressure reduces the action of the nerves. Narcotics act on the stomach as they do on the nervous system in general. Emotions, also, by drawing off the nervous energy, preclude the sensations of the stomach, like those of the other organs. Food, immediately on its commixture with the gastric juice, abolishes the appetite; for the inner surface of the stomach is no longer irritated by the accumulated fluid. Whatever, in short, increases the gastric juice,

increases also the appetite ; whatever reduces the quantity or quality of this secretion, reduces also the appetite. Hence savages, so often destitute of food, remove the cravings of hunger by lime, magnesia, or other earths, and the Kamtschatkadale by swallowing sawdust. These substances produce their effect, not, I conceive, by affording nutriment ; but by absorbing the gastric juice, or diminishing its secretion. Philip relates the following experiment :—“ A person, in good health, “ was prevailed upon to abstain from eating for more “ than twenty hours, and further to increase the appetite “ by more exercise than usual. At the end of this time, “ he was very hungry, but, instead of eating, excited “ vomiting by drinking warm water and irritating the “ fauces. The water was returned, mixed only with a “ ropy fluid, such as the gastric fluid is described to be “ by Spallanzani, and as I (Dr. Philip) have myself obtained from the stomach of a crow. After this operation, not only all desire to eat was removed, but a “ degree of disgust was excited by seeing others eat. “ He, however, was prevailed upon to take a little milk “ and bread, which, in a very short time, ran into the “ acetous fermentation, indicated by flatulence and “ acid eructations.”

Hence we suppose hunger to be *a sensation produced on the nerves of the stomach by the irritation of the gastric juice.*

The subject of THIRST presents comparatively few facts for examination. The chief phenomenon of ordinary thirst, is well known to be the sensation

in the mouth and throat, of heat and dryness, attended by a minor feeling of constriction.

The primary effects of thirst are thus stated by Magendie :—"The mouth, pharynx, gullet, and sometimes the stomach, swell and become red, the mucous secretion ceases almost entirely; that of the follicles changes, becomes thick and tenacious; the flowing of the saliva diminishes, and its viscosity is sensibly augmented. These phenomena are accompanied by a vague inquietude, by a general heat; the eyes become red, the mind is troubled, the motion of the blood is accelerated, the respiration becomes laborious, the mouth is frequently opened wide, in order to bring the external air into contact with the irritated parts, and thus to produce a momentary ease." In animals destroyed by thirst, the internal organs, it appears, are found inflamed.

Whatever reduces the secretions in general, draws off the thinner parts of the blood, or determines this fluid and its essential concomitant, the nervous energy, to other organs than the throat and mouth, produces or augments the sensation of thirst. Hence the distress from the abstraction of liquids. Hence the thirst from copious and ardent perspiration;—the thirst of nurses;—and that also of dropsies dependant on increased action of the exhalents. Hence too the common thirst of inflammation. Violent fits of passion are often succeeded by urgent thirst; for the nervous energy apportioned to the secretions, is expended on the emotion, and the actions to which it gives rise. A similar agency, I conceive, renders

thirst the most severe part of the punishment of torture. The cry of the wretch on the rack is "Drink, drink!"

Thirst is reduced most speedily by Bleeding. This, I conceive, acts by subduing the inflammatory excitement in the throat. The bath, and affusion of water, mitigate thirst;—probably by the sympathy of the alimentary canal, and consequently of the throat, with the surface of the body. It is relieved not only by taking liquids, and thus directly moistening the heated and constricted parts, but even by rolling in the mouth any smooth substance, as a pebble or tamarind-stone. This, of course, is a mechanical stimulus to the secretions of saliva and mucus. Acids quickly reduce thirst. They too perhaps act as stimuli.

Water alone affords by no means the most speedy relief. In hot climates, it is rapidly carried off by perspiration, and according to a remark before made, the increase of secretion on the skin, necessarily diminishes that of the throat. Hence the addition of wine or spirit, by preventing the transpiration of the water, tends to quench thirst much more completely.

"Thirst," says Magendie, "is an internal sensation, "an instinctive feeling; it belongs essentially to the "organization, and admits of no explanation." In the present state of our knowledge no theory perhaps can be firmly established; but the facts to which I have adverted lead to the opinion, that the state of the nervous and vascular systems, termed Thirst, arises from *a want of secretion in the mouth and throat.*

Both Hunger and Thirst appear to be of local origin. They indicate indeed the state of the system at large; but the sensations themselves arise in the stomach and throat. They correspond with the wants of the whole economy; but they do not seem to depend on these wants.

In continued ABSTINENCE, the Hunger and Thirst felt at an early period, wholly or in part subside; the secretions are depraved; the nervous system disordered;* and in mortal cases, delirium or madness concludes the scene.

In extreme abstinence, we learn that the whole alimentary canal is contracted, and the walls close on the empty abdomen; that the gastric† and pancreatic juices, the mucus of the intestines, and even the serum of the peritoneum are partially absorbed. Nay, from the ulcerated state of the villous coat, it seems, that the Conservative Power of the constitution, distressed by the want of nourishment, urges the absorbents to prey upon the live intestine. The blood is said to be depraved.

Of the narratives of *partial* abstinence, I select that of Captain Bligh and his companions, who traversed 1200 leagues in an open boat, and were six weeks at sea, with a store, which, with the articles

* In the most severe orders of the Romish church, the abstinentes are said to suffer from hot eructations and headaches.

† Such was the general observation of Dumas; but Magendie (who nevertheless says that "his experiments entirely agree with that of Dumas!") states that the fluid in the stomach is increased during abstinence. I have made no experiments on the subject.

subsequently procured, would not, in ordinary circumstances, have lasted more than a fortnight. The effect of reduced diet was complicated with that of low temperature and wet; for the party were exposed to sixteen days of heavy and almost continual rain. Hence the first and chief complaints were cold shiverings, cramp, numbness of the limbs,—in some of the party, pain in the bowels,—in most, “violent pain in the bones.” These, of course, were the effects of exposure; but the reduction of diet, and consequently of the volume or quality of the blood, rendered the constitution much more susceptible of their impression.

Constipation of the bowels and tenesmus, swelling of the legs, extreme weakness of the muscles, a hollow and ghastly appearance of the face, dizziness, excessive inclination for sleep, debility of sense and intellect,—these, I conceive, were the effects of abstinence alone. It is remarkable, that the cravings of hunger were never urgent. The Captain himself felt neither hunger nor thirst; but he had a severe pain at the stomach, sickness, and head-ache.

The next narrative, taken from one of the early vol. Phil. Tran. is of a different kind;—*complete* abstinence, and without any account of the symptoms. It is an account of a poor woman, who laid *six days* in the snow. Prior to the abstinence, it appears that she was far from robust. “Being forced from a place,” says the reporter, “where she had taken shelter, she “was constrained to travel, as well as a poor tired “creature could, towards her own home. After proceeding a short distance, she was forced to lie down

“ under a hedge, having lost one of her shoes, and her
 “ cloathes, which were very mean, were with the bram-
 “ bles and thorns torn almost quite off, in which place
 “ she lay from Monday evening, about six o’clock, until
 “ Sunday following about four in the afternoon, she was
 “ then found buried in four foot of snow or thereabouts,
 “ without stockings or shoes, an old whittle about her
 “ shoulders, with a large hole in it, which she had eat
 “ through, the snow melting down on her, which she
 “ drank to quench her thirst.” The poor creature
 recovered. In this case, it appears that the depriva-
 tion of food was sudden—a circumstance unfavourable
 to the power of sustaining abstinence, but counter-
 balanced probably by the previous debility of the
 woman’s health. A fast of similar dura-
 tion, but different result, is detailed in the Manches-
 ter Memoirs, by the late Dr. Percival. A collier,
 confined in a pit, subsisted without food for *seven*
days; but died two days after he was brought
 home. The continuance of life for a week,*

* A Hog has lived without food for 160 days; and a Dog without food and drink for 25. In Good’s Study of Medicine, are quoted several remarkable examples of abstinence among the lower creatures, “ Even the Pike, the
 “ most voracious, perhaps, of all fishes, when he has no longer opportunity of
 “ indulging his gluttonous propensity, will both live and thrive upon water alone
 “ in a marble basin. The mere air of the atmosphere appears to afford nourish-
 “ ment enough for many forms of animal life. Snails and Chameleons have been
 “ often known to live upon nothing else for years. Garman asserts it to be a
 “ sufficient food for the greedy Spider; and tells us, that though the Spider will
 “ ravenously devour flies and other prey, whenever he can seize it, he will not
 “ starve upon the spare regimen of air alone. Latreille confirms this assertion by
 “ an experiment of his own. He stuck a Spider to a piece of cork, and cut him
 “ off from all food whatever for four months; at the end of which period he
 “ appeared to be as lively as at first. Mr. Baker, in like manner, confined a
 “ Beetle under a glass, for not less than three years; allowing him nothing but
 “ air for his diet; at the expiration of this period, he was not only alive, but for-
 “ tunate enough to effect his escape, and go in pursuit of a more substantial

under a total privation of food and drink, can be accounted for only by supposing the secretions greatly diminished. It is worthy of remark that in this as well as the preceding case, the persons breathed a confined and consequently impure atmosphere. Had they been exposed to a current of oxygenized air, the vital powers, I conceive, would have been sooner exhausted. Life, in fact, was rather latent than active. It resembled that of the seed,—buried far beneath the surface of the earth, but ready to vegetate if brought within the influence of the atmosphere.

The effects of *extreme* abstinence are exemplified by a recent case* in Hufeland's Journal. A German merchant, aged 32, depressed by severe reverses of fortune, and the consequent slights of his relatives, formed the resolution of destroying himself by abstinence. With this view, he repaired, on the 15th of September, 1818, to an unfrequented wood, where he constructed a hut of boughs, and remained, without food, till the third of October following. At this period, he was found by the landlord of a neighbouring pott-house,—still alive, but very feeble, speechless, and insensible. Broth, with the yelk of an egg, was given him. He swallowed it with difficulty, and died immediately.

“repast. And we are hence prepared to receive with less hesitation than we should otherwise do, the wonderful tales of Frogs, Toads, Lizards, and other Reptiles, found imbedded in trunks of trees, or blocks of marble, so deeply seated, that, though exhibiting life and activity on exposure to the atmosphere, they must have been blocked up in their respective cavities for fifty, and, in some instances, for a hundred years; cut off from every kind of food except the moisture by which perhaps they have been surrounded, and from all direct communication with the atmosphere itself.”

* This case, I am informed, has appeared in several publications; but its singularity and interest demand its insertion here.

In the pocket of the unfortunate man was found a journal, written in pencil, singular in its kind, and remarkable as a narrative of his feelings and sentiments.

It begins thus:—"The generous Philanthropist, who shall one day find me here after my death, is requested to inter me; and in consideration of this service, to keep my clothes, purse, knife, and letter-case. I moreover observe, that I am no suicide, but have died of hunger, because, through wicked men, I have lost the whole of my very considerable property, and am unwilling to become a burthen to my friends."

The ensuing remark is dated Sept. 17th:—the second day of abstinence.

"I yet live; but how have I been soaked during the night, and how cold has it been! O God! when will my sufferings terminate!! No human being has for three days been seen here; only some birds."

The next extract continues,—“And again, three days, and I have been so soaked during the night, that my clothes to-day are not yet dry. How hard is this, no one knows; and my last hour must soon arrive. Doubtless, during the heavy rain, a little water has got into my throat; but the thirst is not to be slaked with water; moreover, I have had none even of this for six days, since I am no longer able to move from the place. Yesterday, for the first time during the eternity which alas! I have already passed here, a man approached me within the distance of eight or ten paces. He was certainly a shepherd. I saluted him in silence; and he returned it in the same manner. Probably he will find me after my death!”

“ Finally, I here protest, before the all-wise God,
 “ that, notwithstanding all the misfortunes which I
 “ have suffered from my youth, I yet die very unwil-
 “ lingly ; although necessity has imperiously driven me
 “ to it. Nevertheless I pray for it. Father, forgive
 “ him ; for he knows not what he does ! More
 “ can I not write, for faintness and spasms : and
 “ this will be the last. Dated near Forest ;
 “ by the side of the Goat public-house, Sept. 29th,
 “ 1818.—J. F. N.”

It is hence evident that consciousness and the power of writing remained till the *fourteenth day* of abstinence.—The operation of famine was aggravated by mental distress, and still more by exposure to the weather. This indeed seems to have produced his most urgent sufferings. Subsequent to the common cravings and debility of hunger, his first physical distress seems to have been the sensation of cold ; then cold and thirst ; lastly, faintness and spasms. In this case, we find no symptoms of inflammation. A want of nervous energy, arising from the reduction in the quantity or quality of the blood, appears to have been the principal disease. The effort of swallowing, and the oppression of food on the exhausted stomach, completed the catastrophe.

Perhaps the unhappy man might have recovered, had he been more judiciously treated ;—had some nutritious fluid been injected into the intestines,—a gentle heat applied to the body,—ammonia cautiously administered,—and lastly, on the rise of the pulse, and not till then, soup or broth given by the mouth ;—but these several means

employed with the least possible annoyance to the exhausted sufferer.

A case of equal interest, but differing in symptoms, is related by the late Dr. Currie of Liverpool. An elderly gentleman laboured under a scirrhus obstruction of the gullet, which at length prevented his taking any sustenance, either solid or liquid. Subsidiary means, as clysters of broth and egg, and baths of milk, were inadequate to proper nutrition; and Mr. M.'s weight, which in health had been 240lbs., sunk at last to 140. The effects on the animal economy were less than we should have supposed. For six weeks, most of the functions seemed healthy; pulse, heat, respiration,—sleep, without obvious disorder. The urine indeed was at one time scanty, high-coloured, and pungent; the serum of the blood seems to have been diminished; and the bile was defective. But Mr. M. was distressed neither by hunger nor thirst. His intellect was perfectly sound; his spirits were never low; and hope cheered him, even in the closing scene. *Forty-three days* after he swallowed his last morsel, symptoms occurred resembling the advanced stage of typhus. The pulse rose, a muttering delirium and constant agitation supervened, with inversion of the eyes, and an excessive acuteness of sight and touch. A few days before death, and in the decline of intellect, his spirits were still gay, and even his delirium mirthful. Death was ushered in by no peculiar symptom.

The contrast between this and the preceding narrative probably arises from the *gradual* reduction in the sustenance of Mr. M., and the absence of those col-

lateral agents, which gave poignancy to the sufferings of the German.

Death from hunger occurs soonest in the young and robust. An Italian girl of 16, is stated by Sir Wm. Hamilton, to have recovered after remaining eleven days without food, under the ruins of a house at Oppido ; while a child, five or six months old, which she had in her arms, died on the fourth day. The story of Count Ugolino is mentioned by most writers on physiology. This unhappy nobleman, condemned to perish by hunger, was confined, with his four sons, in the dungeon of a Tower, the key of which was cast into the river Arno. Dante represents the wretched parent, in the convulsions of rage and despair, witnessing the death of his youngest child on the fourth day,—then of the others,—himself sinking on the eighth—"victims of the most execrable vengeance ever recorded in the history of man."

The vital organs of the young and robust are accustomed to greater action, than those of persons past the adult age, the old, and the feeble. Containing more of the sanguineous pabulum, they are more freely and energetically supplied. In this state, the abstraction of aliment, and the consequent reduction of the volume of blood, will be soon and severely felt. Hence the inability of the growing and robust, to sustain a protracted fast.

In deep mental emotion, it appears that abstinence may be long sustained. In the Lond. Med. Journal is a reference to a curious record in the Tower, which states, that Ciceley de Ridgeway, in the

reign of Edw. III. being condemned for the murder of her husband, remained for *forty days* without food or drink. The case was considered miraculous, and the king in consequence granted a pardon. An account is related of a young fanatic, who took daily but a pint of water flavoured with orange juice, and on this diet subsisted for *sixty days*.

The greatest reduction of diet has been borne by females. A Scotch woman is said to have subsisted on whey alone, for *fifty years*. The case of Ann Moore is scarcely forgotten. This woman, though convicted of fraud, did really take but a very inconsiderable quantity of food.

The abolition of appetite seems sometimes to have arisen from a change in the animal functions. In the *Phil. Tran.* is an account of Jno. Fergusson, who lived *eighteen years on water alone*. His abstinence commenced in the following manner:—Having overheated himself in pursuit of cattle on the mountains, the man drank excessively of cold water from a rivulet, and fell asleep on the ground. After twenty-four hours, he awoke in a high fever. From this period he loathed every kind of aliment, and subsisted on water,—flavoured occasionally with clarified whey. A gentleman in the neighbourhood, took Fergusson to his house, and locking him in a chamber, supplied him, for twenty days, with water alone. The strictest attention was paid to the exclusion of all other sustenance. The water he drank was in no inordinate quantity. At the end of the experiment, Fergusson's visage and vigour were not in the least impaired. At the time when the

account was transmitted, the writer says, "he is now
 "about thirty-six years of age, middle stature, a fair
 "and fresh complexion, healthy, though not apparently
 "robust; skin, naturally moist and soft. His habit of
 "body is meagre, but in no remarkable degree. His
 "ordinary employ is looking after cattle, by which
 "means he needs must travel four or five miles a day
 "in that mountainous country."*

In this very remarkable case, it appears that the general health was not affected,—though there was a complete abstinence from food for eighteen years. The digestion of solids was abolished; and water and air seem to have afforded the requisite nourishment even to a man of active employ.

In concluding this Lecture I must take a hasty review of a few peculiar properties of the digestive organs, and of some remarkable phenomena which they present.

The stomach is essential to animal life. In numerous classes, neither brain, nerves, lungs, nor heart can be discovered,—but none, I believe, are destitute of a stomach. This deficiency is not found till we arrive at the vegetable kingdom.

The stomach has a sensibility more acute than most organs; and more extensive than any. It is affected by heat and cold, by condiments and various

* Perhaps, some persons will disbelieve histories like this, notwithstanding the evidence which supports them. The credulity of ignorance is a common topic. The incredulity, which results from ignorance or bad education, would sometimes be as useful a theme.

other stimuli. And we are informed that it even possesses the sense of touch. It has also sensations peculiar to itself. Satiety, longing, loathing, nausea and sickness can be felt only in this organ.

In no structure is the peculiar power of the living principle so remarkable as in the stomach. The gastric juice, we have found to dissolve, not only the various aliments, but even the stomach itself, when life has fled. The vigour of the nervous agency alone preserves this organ from destruction.—The solvent would fatally prey upon its parent, were it not for the resistance of the vital principle. Take away this principle, and the stomach is digested along with its contents.

The peculiar vitality of the stomach is moreover *positively* exhibited in its resistance to some of the most virulent poisons. The Ticunas, which, applied to the slightest puncture produces rapid death, is harmless in the stomach. Fordyce “knew a black servant of an Indian merchant in America, who was fond of soup made of Rattlesnakes, in which the head, without any regard to the poison, was boiled along with the rest of the animal.”

The particular directions of the appetite are not less remarkable. All animals seek those articles of food which suit their organs of digestion. The wolf has no desire for roots and herbage, nor does the ox seek for flesh. Nor does man (man, I mean, unsophisticated by habit or disease) long for any food improper for his organs. He desires such proportions of flesh and of bread, and of roots, as suit the existing state of his digestive fluids.

Still more surprising are the cravings of the stomach. Oppressed, or disordered, or excited, whether from its own state, or its sympathy with other organs,—it seeks an appropriate remedy. Thus acidity excites a longing for absorbents or alkalis. The ignorant peasant feels the same impulse with the professor of medicine,—and even brutes, it is evident, have similar cravings. The horse, with faulty digestion, is seen to lick sand or earth; and the hen, during the time of laying, takes mortar, as if conscious that lime is particularly required for the cover of her eggs. In patients recovering from fever, we often find some strange longing,—and this longing, moreover, frequently for articles of food, which the person in health particularly dislikes. But the convalescent eats and drinks with peculiar gust; and his vigour is sensibly increased by the very substance which we should have expected to depress it. The stomach is often wiser than the medical attendant, and requires him to follow her direction, though contrary to what he is taught by analogy and speculation. Whence arise these strange desires? They are not, it is clear, the impulse of ordinary volition. They are not the result of experience. They are the strong voice of instinct, simulating the deductions of reason.

The sympathies of the stomach with other organs, are very remarkable. Need I refer to the impaired digestion, which succeeds to an injury of the head,—or to the vomiting, which disease in the kidney produces? Illustration is scarcely required,—so common are the sympathies of the stomach with remote disease.

The returning vigour of this organ, moreover, is the surest mark of convalescence from fever, and a variety of maladies.

Its sympathies with mental impressions are still more curious. The sickness, which ensues on the sight of disagreeable objects,—the loss of appetite, which grief occasions, are familiar instances. After a meal, the state of the stomach may be so changed by anger or vexation, that its functions are speedily suspended or depraved: vinegar formed instead of its healthy product, and the muscular coat, instead of gently and uniformly propelling the aliment, assuming an inverted action, and rolling up the gullet, volumes of gas. Cheerfulness and mirth, on the contrary, excite the digestive operation; and hence the pleasures of the social meal.

The stomach, moreover, has a remarkable influence over other functions. Take for example the effects of hunger. The vigour of the muscles is greatly reduced, the action of the heart is impaired; the sensibility to cold is increased; respiration is rendered imperfect, and the voice weak; the skin lank and dry; the features shrunk. The taking of food changes immediately the state of the system;—not certainly by the nourishment afforded, for the effect is too rapid,—but by the impression on the stomach. All the functions and secretions are performed with ease and pleasure: the heart beats with force; the limbs contract with vigour; and the countenance brightens. Increase the quantity of aliment, and you produce, with the oppression of the stomach, a general oppression of the system,

—sometimes heat and fever,—sometimes even alarming nervous disorders. In delicate persons, a paroxysm of fever succeeds every copious repast. Disease is

fraught with numerous illustrations. Digestion disturbed by eating certain kinds of fish, is speedily succeeded by an eruption on the skin. If the stomach be distended with flatus, or annoyed with bile, various distressing feelings of the head and heart, or even the limbs, are well known to ensue. A blow on

the stomach produces the most alarming faint, and frequently immediate death. Hence pugilists, I understand, aim at this part as their great object,—a smart shock quickly deciding the contest.

Nor is the influence of the digestive organs confined to the bodily functions. The instance of hunger and satiety presents its agency on the mind. We are all acquainted with the peevishness and irritability, which characterize the former,—the friendship and benevolence, which accompany the latter. The kindly affections we seldom hope for before dinner;—aware, that gnawing at the stomach and good humour are incompatible sensations. Great eaters, it has been remarked, are seldom accessible to sorrow. Even the state of the intestines affects the intellect.

Some have considered the stomach and bowels the seat of emotions. They refer to the peculiar feeling, which joy exists at the pit of the stomach,—the oppressive sensation, which grief occasions at the same part,—the agitation of the intestines, which arises from the darker passions. They might advert also to that “yearning of the bowels” which the emotions

of pity and affection produce. But these interesting observations do not establish the doctrine.

Look at this bag. To a common observer it appears little more than a bladder. How surprising that it should be the seat of functions so important, and sympathies so numerous! How surprising that a man should have an organ like the stomach, and yet be scarcely sensible to its ordinary operations! We might imagine an independent and directing principle to reside in the digestive organs. Conscious of the wants of the body, this provident power employs its ministers, hunger and thirst, to demand supplies. The brain and limbs are consequently excited to procure aliments;—taste and smell to select such as are suitable. No sooner is food received, than the directing principle in the stomach rouses the absorbents to take up the fluid parts. It calls for blood from the circulating system, and vital energy from the nervous; and from these materials, elaborates the gastric juice. It then prompts the motions of the muscular coat, to mingle the solvent with the food, and gradually propel the product. Yet all this, in a state of health,—without disturbing one of the several systems, whence the supplies are drawn, and by which the digestive operations are remotely effected;—all this, moreover, not only without the governance of the mind, but even without exciting its attention. Such observations might excuse the Stahlian, who saw in the vital organs a principle like that I have supposed, sentient, intelligent, and provident. But of such superintendence we have no proof. We find, however, a peculiar nervous system, the *Gangli-*

onic, almost independent of the brain and spinal marrow, yet supplied by these organs with numerous nerves of association, and hence capable of reciprocally giving and receiving impressions. While the independence of the Ganglionic system accounts for the ordinary state of digestion, the communication by interwoven branches admits those sympathies, which we so frequently witness. In states of irritation, several, sometimes all, the systems are disturbed by the agency of the stomach; and reciprocally, the stomach by disorder in any and every system. But of the varied phenomena of gastric sympathy, those which affect the mind are the most remarkable. At one time, we see a man reduced by nausea, almost to a level, in point of intellect and moral feeling, with the oyster; at another, by a grateful stimulus to the stomach, inspired with mental vigour, or animated with hope and delight.

LECTURE II.

DIET.

WHAT a variety of aliments, the three kingdoms of nature present! When we examine the effects of these several articles on the animal economy; when we remark their influence on the growth and health of man, as well in his intellectual as his physical character;—we are not surprised at the interest, which the subject of this Lecture excites, among individuals of every rank of knowledge. When, moreover, we hear persons of intelligence advocate the most contradictory and often absurd opinions, we see an urgent need for information more accurate, and doctrines founded on reflection.

But it may be asked, “Why seek for information, when instinct is our guide? Does not Nature indicate the kind and quantity of food, suited to every creature; nay, to his special, as well as his general wants?” She does. But we are not in a state of nature. Civilization and luxury have depraved the stomach and

perverted the taste. Habits of life purely artificial are successively formed, and by daily repetition, acquire a power, which stifles the calls of instinct. The vitiated stomach has a craving as strong for its noxious stimulus, as the healthy stomach for requisite sustenance.

The subject of food would be too extensive a range, were we to examine in detail the sustenance of the several classes of animated beings. Insects feed on lytta, on jalap and scammony. Hemlock is eaten by hares and oxen; its seed by starlings; stramonium by pheasants; the roots of henbane by hogs. Spiders, it seems, can live on sulphate of zinc. In short, there is no animal substance, however noxious or putrid, and I believe no vegetable, whatever be its principles, on which some of the wonderfully diversified tribes of creation cannot subsist and flourish.

The aliments of the higher classes are generally known. Though the variety is immense, we find each species confined to a limited number of articles,—each species, I mean, when in a state of nature, and surrounded with her stores. Yet few are the animals which may not have the appetite changed by domestication or disease,—which cannot, in the absence of proper food, subsist on aliments foreign to their habits, and often also unadapted to their structure. It is apparent that the digestive canal of a Horse must contract and dilate, to suit the transition from dry to succulent food. But this animal, we are informed, admits a much greater change. In some maritime tracts in the East, he is fed on fish. In the Phil.

Trans. Dr. Tyson states that a horse, in London, accustomed to stand at a tavern door, where oysters were left, at length acquired a liking for this strange food,—crunched the shells, and swallowed them with their contents. In Munro's narrative relating to the coast of Coromandel, it is stated that the dealers of that district fatten horses, by giving them balls composed of the boiled flesh of sheep's heads mixed with grain. A Lamb, kept on shipboard, has been fed with flesh, till it refused the grass, on being afterwards turned into a pasture. Equally surprising is the observation of myself and my pupils, that the Rabbit has drunk the blood of dead animals.* Instances are much more rare of truly carnivorous creatures assuming a diet of raw vegetables.

The varieties noticed in the diet of brutes are not found in a state of nature, and rarely apply to a large number of the species. But when we ascend to man, we find greater varieties, and more remarkable contrasts, and these too in the thousands of tribes and nations. Man is a native of the world. Inhabiting every clime, from the Equator to the 77th degree of lat. he must subsist on the varying products of these regions:—and his digestive organs have a corresponding faculty of accommodation. Need I refer to the diversities of human diet;—the rice of the Hindoo, the dates of the African, the figs of the Greek Islander, the currants of the Cephalonian,—the animal diet of the Shepherds of the Caraccas, the putrid fish, which supports the inhabitants

* The structure of the Rat seems to me destined for vegetable food; yet that animal abounds in the shambles, and is said to prefer flesh.

on the banks of the Orange River,—the raw flesh and warm blood, which feed the Samoides and Russians? The accounts of Travellers abound with illustrations of the faculty, so remarkable in the human stomach, of accommodation to climate and supply.*

Man, moreover, in peculiar situations, may be sustained by substances, which seem almost destitute of nourishment. The Caravans, when pressed by hunger, live on Gum Seneka; a tribe in Africa, almost entirely on an unctious kind of clay; the Otomacs of North America, at one period of the year, on balls of earth. It is apparent from these and similar relations, compared with familiar remarks on the diet of Europeans, that habits,—situation, geographical, political, moral,—civilization in general,—the state of mental excitement in particular,—determine man to a variety, and often a contrast of aliment; a contrast, rarely, if ever found prevalent in any species of brutes.

Natural History exhibits man as an omnivorous animal, subsisting, in one region, on vegetables,—in another, on flesh,—in a third, on a mixture of flesh and vegetables. But it is also apparent that in a low grade of civilization, and inhabiting the cold and temperate regions, he prefers flesh to vegetables, or at least, where the opportunity is afforded, takes a larger proportion of the former.

From Natural History, we turn to comparative Anatomy. The hand of the dissector affords information more precise and accordant than the narratives of

* Are there corresponding modifications of *structure*? We learn that the teeth of the Tartar and African present a remarkable contrast;—those of the former, pointed, and almost serrated,—the latter, with the grinders largely developed.

Travellers. In *animals, which eat vegetables*, we find a large digestive apparatus, or a complicated arrangement; in *those which subsist on flesh*, a comparatively simple canal.* The reason is obvious. The use of digestion is the formation of an animal fluid; and

* In noticing a few of the striking peculiarities in the digestive organs, brutes may be conveniently arranged in three classes.

1. Those, which feed on *Flesh*.
2. Those, which subsist on *Grain, Herbage, or Roots*.
3. Those, which take both *Flesh and Vegetables*.

The teeth of *carnivorous* creatures, as the *Lion, Tiger, Bear, Cat*, are evidently designed for tearing rather than grinding. The lower jaw is so fixed in its socket, as to allow only a vertical motion,—all indeed that is requisite for lacerating or cutting flesh: the muscles which move it are large and strong.

These characteristics are reversed in *herbivorous* animals. No canine teeth are found, but the molares or grinders are fully developed. The extremities of the lower jaw are generally rounded, and in many cases a cartilaginous body is interposed between each and its socket in the skull. This arrangement admits a rotatory motion, particularly calculated for grinding hard substances. You see it in the ruminating *Sheep*. The muscles acting on the lower jaw are much less powerful than those of wild beasts.

In the second class, the *omnivorous*, the teeth and their moving powers hold a middle place, between those of the *carnivorous* and *herbivorous*. The *Hedgehog* affords an example.

In many *predatory* creatures, the gullet seems to expand into the stomach. In several birds it is so wide as to contain whole fishes, till the stomach is ready to receive them. In *Serpents*, the capacity of the gullet is not less remarkable. No such observation has been made on the second and third class.

In *carnivorous* creatures, the stomach is simple, its muscular coat strong, and the secretions of the villous, comparatively small. The intestines are commonly short; the difference between large and small, not generally so great as in man; their inner surface seldom plaited with valves. As illustrating these several characteristics, I may refer to the *Hawk, Polecat, Stoat, &c.*

Gramnivorous creatures, on the contrary, have a large digestive apparatus. The stomach is either compound, or of a figure calculated long to retain the food; or, as a compensation for this advantage, some part of the large intestines is particularly capacious. The *Ox* presents an example of the compound stomach. It has four distinct cavities, each differing in the structure of the inner coat; the three first, affording, by their plaits and processes, an immense surface for the action of vessels.

Rumination is a remarkable adjunct. *Herbage*, after undergoing the actions of the first and second cavities, is regurgitated from the latter in the form of balls. These, successively thrown up the gullet, are re-masticated, and afterwards descend into the third, a valve preventing their admission into the first or second. From the third,—the food, in due time, is transmitted to the fourth. The inner coat of this cavity nearly resembles, in structure, colour, and secretion, that of *carnivorous* creatures, and the alimentary mass, which it receives, is probably rendered, by the previous elaboration, similar to masticated flesh. An in-

substances already animal, need little elaboration ; while vegetables, in proportion to their distance from the animal kingdom, require a complicated apparatus, a period of digestion comparatively long, and a large extent of absorbent surface.

In *omnivorous* creatures, the digestive structure is in the medium between those of the carnivorous and herbivorous, or a compound of the two.

I have now before me the digestive apparatus of

interesting observation is made on the stomach of the sucking calf. Almost all the milk passes at once into the fourth cavity. The first, second, and third, useless while the calf subsists on a nutritious animal fluid, are comparatively small,—but when it takes grass, their surfaces expand and secrete.

Granivorous Birds have generally two or three stomachs, varying in figure and size. In the common fowl, we find the Crop, the Infundibulum or Craw, and the Gizzard. Grain received into the crop, is subjected to the action of its juice. In due time, it is propelled in successive portions, into the craw, where also it is acted on by a digesting fluid. The mass is next thrown into the gizzard. This is well known to be a strong muscular cavity, lined with dense tendon,—a structure evidently designed as a substitute for teeth. Here the food is bruised and comminuted, so as to admit final digestion in the intestines. The gizzard is commonly compared to a mill, and the craw to a hopper. It should be remembered, however, that the craw is not a mere receptacle ; that it is studded with numerous and large solvent glands ; and that both the crop and the craw not only retain the food, but prepare it for the action of the gizzard. Pebbles and pieces of glass are often found in the stomachs of fowls. Spallanzani supposed them swallowed by accident, the birds mistaking them for corn ; but Fordyce remarked that chickens take only a certain proportion, and many die, if this proportion be withheld. These foreign bodies, it appears, assist in breaking or rather grinding the grain, for the noise of the gizzard may even be heard. They do not, in general, injure the organ, protected by so dense and insensible a lining. They are even found to be partially digested ; for the hardest pebbles and pieces of money lose weight by remaining a few days in the gizzard. It has been stated, moreover, that leaden balls are flattened in this cavity. But the following observations prove that this remarkable agency is not always exerted. A bullet was impelled down the gullet of a Fowl. A few days after, we found the bullet pitted, but not flattened. The experiment was repeated on a dunghill Cock. He was evidently pining away, when we killed him on the sixth day. The bullet was unchanged. A large pistol ball was forced on a Turkey. The bird appeared to suffer no inconvenience ; and when the gizzard was examined on the 5th day, the bullet had no other impression than a slight irregularity of surface, produced, apparently, by the attrition of the pebbles. In regard to the stomachs of birds, I may refer to

the Man and the Monkey. They are alike in figure and arrangement. But when the teeth, the stomach, and the intestines of either of these animals are compared with those of the predatory Polecat, or the Ox, and the Rabbit,—we see a remarkable difference ; and infer the man and the monkey to hold an intermediate place between the wild beast and the eater of herbs.

From his structure, we deem man to be an omnivorous animal. His teeth associate him with the simiæ ; his stomach, with the Lion ; his large intestines, sacculated, with the Ourang-Outang and Rat of New Holland. We, therefore, infer that

a difference, stated by Sir E. Home, between the Emew and Cassowary of New South Wales, which exhibits in an interesting manner the economy of nature. The birds are similar (in species ?) but one inhabits the luxuriant island of Java ; the other a less fertile country. The former has small solvent glands in the craw,—the gizzard comparatively weak, and so placed as not to be in constant use,—the intestines short and of small diameter. All these circumstances are reversed in the Cassowary of New South Wales : the digestive organs have an increased capacity and power, to derive adequate sustenance from a less plentiful supply.

Where vegetable feeders have not a compound stomach, there is generally a compensation in some other part of the digestive apparatus. In the Horse, for instance, the stomach is comparatively simple, its form resembling that of the human subject, and its size remarkably small in proportion to the general bulk. This apparent defect, in an animal destined to live on vegetables alone, is compensated by the figure and capacity of the large intestines, especially the cecum. This bowel may be considered a second stomach. In the Rabbit also, the stomach is simple ; but its openings are so situated as long to detain the food. Part of its inner surface also is villous, resembling the human stomach, and fourth stomach of cattle. But the principal increase of the digestive apparatus is in the cœcum, which is of large diameter, and longer than the whole animal. Specimens of most of these structural arrangements I have now before me. In herbivorous creatures, the intestines in general are large and long. In a Canadian Stag, these bowels have measured 96 feet. I have found those of a Sheep 90. The intestines of the Squirrel are stated to be eight times the length of the animal ; of the Dromedary, 15 ; the Ox, 22 ; the Deer, 12, &c. Where the intestinal canal is short, we often find a compensation in the enlargement of a part. The Elephant, we learn, affords an example. Similar observations on the organs for the digestion of vegetables, might be carried through the several classes of animals, down to the Grasshopper and Cricket.

his digestive apparatus is ordained for various and opposite kinds of food ; and that his diet should be accommodated to climate, situation, and habits.*

Notwithstanding these facts, vegetable food has been recommended as the *only* proper sustenance of man. We certainly find a vegetable regimen highly useful in certain cases of disease, or disposition to disease. In Epilepsy, and in some affections of the head, and in most diseases of the heart, I have employed it with marked utility, and in some disorders of the digestive organs with minor advantage. In gouty habits, it has sometimes been highly useful.† There are, moreover, peculiar constitutions, which, though apparently

* Dr. Lambe's second Reports on vegetable Regimen, I have read with attention. From his system we may anticipate great advantage in many chronic maladies : but its universal propriety in health is not proved. His statements are often partial, and his deductions frequently defective in precision. In comparative Physiology, the strongest support of the vegetable regimen is the close resemblance between the digestive organs of the man and the monkey, added to the general statement, that the latter in a state of nature is completely herbivorous.— It might be urged that monkeys in this country readily take animal food, even in the abundance of vegetables ; and in their native state, travellers have asserted that they often eat eggs, seize insects, and sometimes come to the coast for crabs. Perhaps we are not yet sufficiently acquainted with their natural diet and habits. But at present, *we allow* the circumstance to favour the advocates of the vegetable regimen. We fear not to concede a disputable point.

Dr. Lambe, as quoted by Mr. Newton, affirms that "all carnivorous animals have a smooth and uniform colon, and all herbivorous animals a cellulated one." This observation I understand to be *universal*, it ought only to have been *general*. The bat-tribe and some other carnivorous creatures have a cellulated colon. My limits forbid my entering on the subject in detail.

† It has been tried in other maladies. From a statement in Halloran's work on Insanity, urged by Dr. Lambe in support of his system, we learn that in the Cork Asylum, the patients, though generally kept on a low or vegetable diet, are at certain periods allowed "a few generous meals of animal food." On these occasions, "the strictest precautions are invariably adopted to provide against the scene of uproar which is sure to follow." The maniacal excitement may be attributed rather to the sudden *transition* from a poor to a richer diet, than to the simple effect of animal food. On inquiry, I learn from my friend, Dr. Ellis, of the Wakefield Asylum, that low regimen is found decidedly injurious to the patients

healthy, will not bear a diet of flesh. In some individuals the stomach even nauseates the idea.

Two cases have recently fallen under my notice. in which the individuals, without professional advice, adopted a diet of vegetables. Mr. W. tells me, that suffering long under bilious disorders, and obtaining little relief from medical treatment, he tried a strict regimen of vegetables and water. His health and spirits, he assures me, have since been greatly improved; and he is, consequently, a warm advocate of the herbivorous system. But within the last two years he has judiciously added to his dinner—a moderate proportion of flesh.

A gentleman from B. who had been under my care for a chronic disease, was induced, soon after his recovery, to try the vegetable system. After its use for some months, he informed me that it had removed an oppression from the head, which though slight had been before almost constant; that his general comfort was increased, and his strength by no means reduced. But lately I learn, that he, as well as Mr. W. has added meat to his dinner of herbs. In neither of these cases do I doubt the advantage at first received, but I conceive that it was not imputed to the true cause. These observations, with many of a similar

in that institution; that it reduces the strength of the constitution, but not the severity of the disease; that the paroxysms of madness are even increased in violence and frequency during depletory treatment. The opinion of the medical officers, is evinced by the fact that at present, (April 22, 1824,) of 230 patients, there is only *one* on low diet.

The vegetable regimen has been recommended for incipient Consumption. Its employment in these cases I have not witnessed; but among other instances I am informed of a Physician in the North of England, who, to avert this melancholy disease, kept his family on low diet. Nevertheless, nine died.

kind, might be usefully compared with the statements of Dr. Lambe and Mr. Newton. The full examination of the subject would prove, I believe, that though a strict vegetable regimen, in certain peculiarities of constitution, and in some states of disease, is highly advisable, almost essential to life and health, it is by no means the only sustenance, which suits the healthy organs of man.

The system has been recommended for the mind as well as the body.* A strict diet of vegetables is said to improve the intellect. Sir I. Newton, it is well known, when writing his treatise on optics, abstained from flesh. Dr. Lambe states that his rigid regimen has increased, considerably, his intellectual powers. In Watts' work on diabetes, is detailed the case of a student, the subject of severe depletory treatment, whose intellect was raised in the inverse proportion to the reduction of his body. From my own observation also, I am convinced, that by low diet the intellect is often relieved and invigorated.

But on the other hand, I have seen it improved by an opposite system. A young gentleman who has tried various diets, assures me that his mind is most capable of exertion, when his body is most plentifully nourished. He now takes flesh twice, and milk once, a day. Dr. Stark, on taking beef, after a low diet, had "a keenness for study." On inquiry I learn, that at

* "There can be no doubt then, that animal food is unfavourable to the intellectual powers, in some measure this effect is instantaneous, it being hardly possible to apply to any thing requiring thought after a full meal of meat, so that it has been not improperly said of the vegetable feeders, that with them it is morn-ing all day long. But its effect is not confined to the immediate impression. As well as the senses, the memory, the understanding, and the imagination, have been observed to improve by a vegetable diet." Such is the statement of Dr. Lambe.

Cambridge low diet is unknown. It is said, that the senior wrangler of a late year took a large quantity of flesh.* Dryden and Fuseli, to exalt their imaginations ate raw meat.

It is evident from these and similar observations, not only that the intellect may be powerful on contrasted diets, but that advantage has been derived from an increased proportion of flesh, as well as from the opposite change. To vigour of mind, a proper circulation through the brain, a supply of blood healthy both in quality and volume, is always requisite. Now, the digestive organs of individuals vary so much in their power of abstracting nourishment from like quantities and kinds of aliment, that a diet, which is moderate to one, will be excessive to another. One student, living chiefly on vegetables may have the brain weak or torpid, from the defect of good blood; another, taking a richer diet, may have the brain oppressed from sanguineous excess. Let there be a mutual transfer of diet to suit the opposite constitutions of their digestive organs, and the state of the brain in both individuals will be materially improved.

Aware that the moral disposition is affected by diet, we cannot think Galen presumptuous, in desiring the teachers of philosophy to send for his treatment all persons of bad character. "I know more than one instance," says Arbuthnot, "of irascible passions being much subdued by a vegetable diet." A gentleman of the sanguine constitution, who, for some months,

* In a letter from a Cambridge student, the expression is, "He could eat a shoulder of mutton for dinner."

took only vegetables, informed me that his temper became much less excitable. Another of an opposite constitution, was observed, during the time he lived on a reduced diet, to be more irritable. The subject has been little regarded ; but its importance claims for it close and continued observation.

A *Diet of flesh alone* has been enjoined in some cases of Diabetes, but rarely practised for a considerable time. The details in Rollo's work are well known. Dr. Stark, when living a few days on the "stewed lean of beef, with the gravy and water," found his spirits raised, and his disposition for sleep considerably diminished.

It is worthy of remark, that animal food sometimes reduces the weight of the body, and vegetable, generally increases it.

The ordinary MIXED DIET will claim our principal attention. The great object of digestion is the formation of chyle ; and consequently, whatever affords it in the largest quantity and of the best quality, will be most nutritious. In this view, let us compare vegetable and animal food.

In reference to vegetables, it has not yet been ascertained, which of their constituents afford the materials of chyle ; but it is probable that the chief are Starch, Gluten, and Sugar. The first of these forms the basis of our principal vegetable food, the farina of seeds. Gluten is an important addition. To its agency, I believe, we owe the formation of flour into bread. Those vegetables which are destitute of gluten, are proportionately less convertible into chyle. Hence, rice and potatoes, though abounding in starch, yield comparatively

little nourishment. This is not contradicted by the Hindoos living on rice, or the Irish on potatoes ; for both nations take *large* quantities of food,—and with the addition, moreover, of a nutritious animal fluid, milk.

Sugar seems the first support of vegetable life ; and it is well known to be the principal food of young animals. It, perhaps, yields a greater quantity of chyle, than any other constituent of plants. The slaves in the West Indies are lean and weak when they live on rice, but become fat and robust in the sugar season.* Indeed, this period restores vigour, health, and hilarity to the whole district,—to the cattle as well as the men. “ In decrepid old age,” says Richerand, “ some persons live exclusively on-sugar.”

Sugar is contained in most vegetables, but is well known to be especially abundant in the sugar-cane, in the grape, and in fruits in general. Of roots, the carrot, beet, and parsnip, are understood to possess the most. In addition to these vegetable aliments, I may mention gum, which exudes from various trees,—and mucus, abundant in the seeds of line and quince, in lichens, mallows, and in bulbous roots.

Sugar, Oil, Butter, and Gum, have recently been the subjects of interesting experiment. Magendie fed dogs on each of them singly. Under this regimen the bile and urine acquired the character of those of herbivorous animals ; the muscles were reduced to one-sixth of their healthy volume ; and death ensued in from 30 to 40 days. It is probable, therefore, that aliments devoid of azote, are inadequate to the support of dogs. In other experiments on the same kinds

* Impure sugar is said to contain a considerable proportion of Azote.

of food, he found chyle plentifully produced ; but we do not learn that its character was particularly examined.

Stark, in one of his courses of experiment, repeatedly took 8 oz. of sugar at a meal, without cloying his appetite. Thirst was considerably reduced. At a subsequent period, his solid food was honey, with bread or flour. Though his health at the time seemed little affected, he afterwards thought that his constitution was injured by "sweets."

The elements of chyle are evidently more abundant in animal, than in vegetable food. Marcet found the chyle of carnivorous creatures to be whiter, to contain more solid matter, and to yield more albumen, than that of the herbivorous. This observation we should anticipate, from considering the nature of animal food, and the approximation of its principles to those of the product of digestion. Gelatine, Albumen, and Fibrine, the chief constituents of flesh, approach nearer to the nature of chyle, than starch, sugar, and gluten, the chief constituents of vegetables. Azote is the principal element in the animal fabric. Flesh, therefore, yields it abundantly ; while in vegetable substances it is scanty, and in many, as urged particularly by Magendie, wholly absent. When, however, this gas is not provided in the food, it may perhaps be derived from the atmosphere, by the lungs or skin. In articles of animal food, there is less variety than in those of vegetable. Though greatly differing in their digestibility, almost all yield abundant chyle. Muscle, on the whole, is the most valuable.

If then we find good chyle to be produced both from

vegetable and animal food, the question is, which affords it in the proportion and circumstances best suited to the individual. This, in fact, though overlooked by the advocates of a particular regimen, is the great dietetic inquiry. Several circumstances claim our attention.

Of these I first notice, *age*. During the period of growth, the nutritious quality of aliment is especially important. A mild animal diet is most suitable for children. We remark that the young, even of some granivorous creatures, are fed with animalized food. Milk is the sustenance of calves and lambs. The young pigeon is fed from its parent's crop with grain moistened by the secretions, and mixed with curd.

The middle period of life requires more of a vegetable regimen, and a stricter attention to temperance. It is this period, for which dietetic rules are chiefly adapted.

The change from a high to a reduced diet can rarely be borne in advanced life. Nor does a low diet, even if practised before, suit this period. Age requires food in small quantity, but nutritious and soluble. At every period, and in every state, the diet should be accommodated to the power of the digestive organs. This is considerably reduced in the advance of life; and the work allotted to it, should be proportionately small, and of easy execution. Such was the practice of Cornaro. "O, how advantageous it is to an old man to eat but little! Accordingly, I, who know it, eat but just enough to keep body and soul together; and the things I eat are as follows. First, bread panado with an egg, or such other kinds of soup or spoon-meat. Of flesh meat, I eat veal, kid, and mutton. I eat poultry

of every kind. I eat partridges, and other birds, such as thrushes. I likewise eat fish, for instance, the gold-ney, and the like, amongst sea fish; and the pike, and such like, amongst fresh water fish. All these are fit for an old man.”

The quality of food should have reference not only to age, but to *habits*. The richest aliment is by no means the best for every individual. In proportion as it affords chyle, it tends to repletion in those, who take little exercise. If the merchant or the artisan live freely on flesh, he suffers from feverishness, headache, or sluggishness. If the sedentary man of letters commit a like error, his mental, no less than his bodily, faculties are oppressed or disturbed. In these, and similar cases, the secretions are considerably reduced; less is thrown off by perspiration; less is poured into the alimentary canal. Consequently the blood, the great source of all the animal fluids, is expended in less quantity; and fewer materials for its regeneration are required by the system. The quantity of chyle should be reduced to a balance with the consumption effected by the secretions. If full meals be taken, vegetables should form a large proportion. On the other hand, the countryman who gains his livelihood “with the sweat of his brow,” may safely charge his blood vessels to the plenitude of health. No morbid plethora can take place, while the consumption equals the supply. His diet should be chiefly animal.*

* I inquired of Mr. P. why he takes a richer diet, when some months ago he informed me of the benefit he derived from a low one. He replies, “Having commenced a more active employ, and the exercise I now take in the open air, being a great deal more than during the period alluded to, I found it necessary to return to animal food.” This is a useful illustration of the

On the same principle, the sportsman is hale and vigorous on a diet, which would make the sedentary, apoplectic. Captain Barclay, during his astonishing walk of 1000 miles in 1000 successive hours, took daily from five to six pounds of animal food.

It should be remembered, that in civic life, a state of full health cannot be maintained. It soon becomes the settlement of disease. Sometimes you see the citizen robust and florid as the peasant; but ere long you will find him labouring under an oppressive affection of the brain, or other serious disorder. The full health even of men trained for boxing or running, soon declines. Horses, fed and trained for the course, lose their vigour after a certain time. The gamecock often dies, if he be prevented fighting at the period, for which he is prepared. If the excess of vital power, produced by his diet, be not spent on extraordinary effort, it becomes the pabulum of disease. It is also probable, that a diet excessively rich, though balanced by proportionate exertion, will, if long continued, considerably shorten the duration of life.

The *state of the atmosphere*, should also, I conceive, influence the proportion of flesh. Less should be taken by the inhabitants of large towns, than by those who breathe unpolluted air. A full diet is only proper for full health; and this state is scarcely ever compatible with an impure atmosphere. My readers will recollect

principle in the text. Before he confined himself to a vegetable diet, his spirits were not good; they were afterwards considerably improved; nor have they since declined, though he now takes as much animal food, as before he attended to regimen. It is obvious that repletion and its effects on the spirits, are now prevented, by his increased exercise in the open air. The circumstance, also, exemplifies the principle of accommodating diet to the state of the atmosphere.

the final conversion of chyle into blood, assigned to respiration. If the atmospheric air, which we believe to be the principal agent in the change, be impure, it will be proportionately unfit for its office; and if full quantities of chyle be brought to the lungs, some will be sent to the heart, without having undergone the essential change. The circulatory system will consequently be loaded with more or of less an improper fluid, and disorder of the animal functions must ensue.

In ascertaining the due proportion of flesh and vegetables, we must examine also the *stimulus* they afford. The stomach, we have remarked, is a highly sensible cavity: it has an intimate communication with the brain, and with the organs of circulation. Excessive stimuli to the stomach induce headache and feverishness; the excitement of the nervous system affects the organs of secretion; and the fluids, which these pour out, are consequently defective in quantity, or depraved in quality. Thus in the round of agencies, the solvent juices of the stomach and bowels become unhealthy; and the function of digestion may be remotely impaired by substances most susceptible of its operation.

There is considerable variety in the aliments both of the animal and vegetable kingdoms, as to the property of stimulus. Does not this bear a relation to the quantity of salts, they respectively contain? Vegetables in general are well known to be less stimulating than flesh;—and of the constituents of a mixed diet, Gelatine, Starch, and Mucilage, than Fibrine, Albumen, and Sugar. Young meats, consisting so much of gelatine, are milder than old. When the body is too much ex-

cited, even by the blandest animal substance, starch is the best food ; and of the vegetables which contain it, the flour of wheat is generally preferable. Of all animal substances, perhaps Milk combines least stimulus with considerable nourishment.

The qualities of the Egg have been differently represented. Some consider it, in a dietetic point of view, as holding a middle place between flesh and herbs. Some find it stimulating and of difficult solution. Eggs are known to contain a large proportion of sulphur ; and the gas, which, in many individuals, rises during their digestion, is evidently sulphuretted hydrogen. But those persons, whose stomach they do not offend, may take eggs as one of the best articles of diet.

We often find the most digestible articles, and the most nutritious, to be very exciting. Hence, when the stomach is weak or irritable, as in convalescence from serious diseases, we are obliged to employ food of a less stimulant, and at the same time of a less nutritive quality. It is for this reason, that white meats, especially Fowls, are so frequently directed.

Putrescent meat is nutritious, but too exciting ever to constitute a wholesome aliment. The same observation applies, though in a less degree, to the Goose, Duck, and most aquatic Birds.

In some states of the system, even when full nourishment is required, a regimen of eggs, milk, and bread, is preferable to one admitting the ordinary proportion of beef and mutton.

A still more simple diet is required for infants. Nutritious food, as I before remarked, is requisite for the young : but stimulating aliments are decidedly injurious. In infants, the inner coat of the ali-

mentary canal, in common with the other mucous membranes, is much thicker, more vascular, and sensible, than at a later period of life. Hence strong and seasoned food disorders children in general; and solid aliments, even of a simple kind, often affect the more irritable bowels of the suckling.

In reference to stimulus, the *temperature* of the food must not be overlooked. The season of the year has an influence in our choice of warm and cold dishes. But when the latter are not recommended, either by the heat of the weather, or the peculiar state of the body, our food should be about the temperature of 98°. This is of some importance to the stomach which is weak and disordered, and which has consequently no spare energy for imparting heat to its contents. Hot dishes, on the contrary, induce debility by excessive stimulation.

Another circumstance connected with the subject of stimulus, deserves notice. The *detention of food* in the stomach, is necessary to digestion. The gastric juice does not decompose substances, like the galvanic aura. Its operations are gradual. By the contractions of the muscular coat, it is applied to successive portions of aliment. All articles therefore, which by their stimulus produce a rapid action, are injurious. To this, I attribute the circumstance of bitters' frequently impairing the digestive process. They habituate the stomach to propel its contents, before these have undergone the action of the solvent fluid. The observation applies, of course, to bitters taken with our food,—as the hop, in ale and porter. Pickles and Condiments, taken largely

by persons in health, not only create an artificial appetite, but produce by the repeated stimulus, an inflammatory state of the villous coat of the stomach. High seasoning, however, is not always improper. Certain torpid states of the digestive organs, require them; as they require wine or alcohol. Then, and then only, should such stimulus be allowed. In hot climates, Peppers are taken in large quantities, not only without apparent injury, but as preservatives against Fever.

Condiments are not all equally pernicious. Those substances, which enter into the chemical constitution of the body, are probably the chief exceptions. Hence a moderate quantity of Salt, is not only useful, but even necessary. In one of the journals, a reference was made to the circumstance of some Dutch criminals, who were sentenced to have food without salt. They soon became wretchedly diseased, and all died miserably. You are aware of the estimation, in which salt is held in many parts of the East. It is the epithet of excellence; "the salt of beauty!" It is the money of some districts. It is the proverb of benefits and obligation. "How can we rebel," say the Sepoys, "against the Company, whose salt we have eaten?" The immunity, which our sailors enjoy from that distressing malady, the Stone, has been attributed to the quantity of salt, they habitually take, and the consequent vigour of digestion. Salt recently dissolved, appears much preferable to that contained in dried meats.

I scarcely need observe, that the peculiarities of individual constitution, should influence the diet. Persons of great excitability must, of course, take mild food;

and all must regard the particular predilections and antipathies of the stomach.

Climate, and the heat of the weather, should have an influence on the stimulant quality of the food. Man, though omnivorous, is instinctively taught a diet more or less exciting, according to the temperature of the region in which he dwells. The inhabitant of the torrid zone, is supported chiefly on fruits and vegetables; the native of temperate regions, on flesh and vegetables; the frozen tenant of the North, on putrid fish, seals, and the like. Richerand justly remarks, that the philosophical or religious sects, by which abstinence from animal food was considered meritorious, were all instituted in warm climates. The school of Pythagoras flourished in Greece; the Ascetæ,* in Egypt; and the anchorets, who, in the beginning of the Christian religion, peopled the solitudes of Thebaid, could not, in a colder region, have endured such long fastings, or supported themselves on dates and water. Indeed, we find that the Monks, as they extended into different parts of Europe, were obliged to relax from the severity of their pristine regimen. The most austere added to their vegetable diet, eggs, butter, fish, and even water-fowl. On the same principle, the natives of higher latitudes, when they remove to a warm climate, find great advantage from an opposite change.

After adverting to the nutritious and stimulating

* Philo relates, that "lying in straw upon the ground, they wholly abstain from wine, and eat nothing that has blood in it: water is their only drink, and their food is bread, with salt and hyssop."

qualities of aliments, we must examine their *digestibility*.

This of course, varies as much as any of their other properties.

Gosse of Geneva, ascertained by "experiments performed on himself, that the animal and vegetable fibre, concrete albumen, white and tendinous parts, paste containing fat or butter, substances which have either not undergone fermentation, or which do not really undergo that process, remain longer in the stomach, offer more resistance to the gastric juice, than the gelatinous parts of animals or vegetables, fermented bread, &c.; that the latter required but an hour for their solution, while the former were scarcely dissolved at the end of several hours." But we must examine the subject rather more in detail.

The flesh of adult animals, is more easily digested, than that of the young. Venison, Beef, and Mutton, most readily afford their nutriment. Hare, Partridge, and Game in general, are more digestible than Turkey, Fowl, and Rabbit; and these, than Pork, and salt-meats. Fishes differ considerably in their susceptibility of digestion. Turbot, Cod, and Haddock, are perhaps as digestible as fowl and rabbit. Soles and Salmon are of more difficult solution.* It should be remembered

* My pupil, Mr. Whytehead, has furnished me with the following statement. "Fresh-water-fish are in general more digestible than sea-fish,—and those caught in rivers and brooks, than others which inhabit ponds and stagnant waters. The silver eel, which is found in clear rapid streams, is highly nutritious and digestible; but the same animal, when placed in a muddy stagnant pool, becomes fat, tough, and unwholesome. Trout is well known to be entirely changed in a short period, by the qualities of the water in which it dwells. Every brook has inhabitants of a different colour. The same fish, which, in the Wharfe is of a beautiful golden hue, becomes nearly black, and quite unwholesome, as it ascends into a stream supplied by a chalybeate spring."

that the sauce, taken with fish, is often more pernicious than the aliment itself. Shellfish is worse than salt-meats; but several species, as the Crab and Lobster, are said to be rendered more soluble by long boiling.

Though almost every part of animals affords nutriment, muscle (flesh) yields it most readily. It is known also, that some muscles are more easily digested than others.

Fat is scarcely soluble in the human stomach. Yet Sir John Pringle knew a lady, 90 years of age, who ate this substance as her only solid aliment. Stark found the oil of suet, in the quantity of 4oz. daily, to be nutritious and agreeable. It should be remembered, however, that he laboured under disease in the mucous membrane of the intestines; and for this, I conceive, was the particular diet adapted. Moreover, a few days before his death, he thought his constitution injured by an immoderate use of fatty substances. To fat, the stomach of the young has a natural antipathy; but this is often mistaken for fastidiousness, and children are cruelly compelled to disorder their digestion.* Butter is generally pernicious to the delicate stomach. Its addition to farinaceous aliments, promotes their deglutition, before a sufficient effusion of saliva, and consequently tends to prevent perfect and easy digestion.

* At schools, it was not uncommon for the selfish masters to provide meat excessively fat,—bacon, and the like; with the object, undoubtedly, of palling the appetites of those, they had engaged to feed. A schoolmaster in the North Riding was in the habit of inveighing against others of the same profession; “They do not provide enough for the boys’ growth; but *here* there is always plenty of rich meat.” His table, indeed, was generally covered with the fattest of the Shambles; and when a dish happened to be lean enough for the boys to take without disgust, equal slices of fat from an old dish, were always added, and without this qualifying addition, the fresh was not allowed to be eaten!

It moreover directly oppresses the stomach; often aggravating, sometimes perhaps inducing, Dyspepsia.* Pastry, is probably the worst form in which butter is taken.

Cheese varies less in its degree of digestibility, than in its nutritious and stimulating qualities. It is with difficulty changed by the solvent fluids; and hence in large quantities, it is very pernicious. Lately, I was called to a lady of an apoplectic disposition, who was well and cheerful in the evening,—ate a hearty supper of toasted cheese,—was seized soon after with a fit, called for assistance,—became violently convulsed,—and spoke no more. Instances like this are by no means infrequent. A person goes to bed after a hearty meal, and is found in the morning, dead or paralytic. The hearer is surprised and affected at the tale—moralizes on the uncertainty of life and health—but rarely inquires into the cause—rarely inquires, what course of life gave the disposition to disease, and what oppression of the stomach induced the catastrophe.

Substances, which from their texture or consistence are but imperfectly pervaded by the gastric juice, must be difficult of digestion. Hence new Bread is particularly objectionable. Two soldiers (mentioned by Schmucker) who had eaten immoderately of fresh-baked bread, complained of great uneasiness at the stomach. To this, vomiting succeeded; the abdomen became hard and tumid; the pulse sank; and death was the

* Two members of my family, were annoyed with disorder of the stomach, after breakfast. One in particular was uneasy, depressed, and irritable, during most of the forenoon. Plain Bread, or Toast, was substituted for *buttered* Toast, and the disorder was removed in the one case, and materially relieved in the other.

speedy result. On examination, "the intestines," says Schmucker, "were found extremely distended with air, and singularly contorted." A large bulk, even of stale bread, is improper. Its centre is not easily penetrated by the gastric juice. Hence, where this fluid is defective, oppression and flatulence are the common consequence. It is singular, that bread,

which we esteem the staff of life, should be scarcely known in many countries, and disliked in some. We are told, that the first threat, used by the Persian to a disobedient child, is, that he will give him bread to eat.

I conceive that our estimate of bread, is higher than its merits. It affords much less nutriment, than many other substances, especially those of animal origin; and though less exciting, it is much more difficult to digest. Valuable as one among the articles of food—valuable also, as counteracting the too stimulating effects of flesh, it is still by no means to be regarded as the greatest and best support of man.

Green vegetables are also useful, as modifying the effects of stronger aliments. They have often been found unchanged, even in the lowest intestines; and hence we must deem them incapable of complete digestion, by the human organs. The common esculent Roots are more easily changed. In digestibility, Turnips are preferable to Carrots; and these to Potatoes.

Fruits vary in their susceptibility of digestion. Of the common kinds, the best are the Strawberry and Orange;* next may be mentioned the Rasp, Gooseberry,

* Lemons and limes have been objected to by a German Physician, on account of their being exported in an unripe state, and their acid remaining without fermentation.

and Currant ; Pear and Apple ; the Grape ; the Apricot, Nectarine, and Peach ; the Cherry and Plum ; the Almond and the Nut. It is well known that stone-fruits are objectionable, from the prussic acid they contain. Raisins, Figs, and Prunes, are less used than they ought. Cucumbers are difficult of digestion ; Melons and Gourds contain scarcely any thing worth the operation.

Substances rapidly transmitted through the digestive organs, are not always easy of digestion. In the preceding Lecture, I observed that the stomach sometimes hastens forward an article little susceptible of its action, while it retains another, readily affected by the gastric juice. Thus flesh and potato, taken at the same time, have been found in distant parts of the alimentary canal ; the flesh in the stomach, dissolved into pulp, and the potato in the bowels, scarcely changed in its appearance.

The facility with which aliment is digested, is in general an important recommendation. But persons in whom the digestive powers are strong, require food less susceptible of the gastric influence. The calls of hunger would recur too often, were they to take substances easy of digestion. The English labourer prefers Bacon or Pork, because with this food he is able to work long, without being hungry. The men, employed on some of the north roads, take nothing from morning to night, but a few hard-boiled eggs, and water from the ditch. On this diet, they pass the day with comfort. The Hollander, before he commences a long winter's journey on the ice, eats a large quantity of coarse brown bread, the food best calculated long to employ his digestive organs, and prevent that sense

of fatigue; and pain at the stomach, which inanition occasions.

Diet should have regard, not only to the quantity of chyle produced, the facility and perfection of digestion, but also to the *peculiar properties* of different substances. Many articles contain the elements of nutrition, combined with others specifically injurious to the animal economy. Mushrooms, it is probable, are highly nutritious; but tainted so deeply with a narcotic principle, that their rich and sapid qualities are but a bait to the unwary.* Many species of Arum, contain farinaceous matter, but are objectionable for the same reason. The root which yields Cassava, is poisonous in its natural state. Artificial preparation alone, by separating the farina from the deleterious principle, can procure a wholesome aliment.

An important branch of our subject has not, I believe, been discussed by dietetic authors; I mean the effect which *change* of food produces on the general system. That considerable and even sudden transitions may be borne by the healthy stomach, is apparent from many observations. I cite only the statement of Franklin, who several times suddenly altered his diet from mixed to vegetable, and from vegetable to mixed, without inconvenience. The disposition to change of diet and habits, is observed in some individuals, and generally censured as the effect of caprice. I am inclined to consider it an instinct, which conduces to health.

* The ancient Hindoos, according to Sir William Jones, held the Fungus in such detestation, that Yama, a legislator, supposed now to be a judge of departed spirits, declares "those who eat Mushrooms, fully equal in guilt the slayers of Brahmens, and the most despicable of all deadly sinners."

On a new diet, the countenance, the muscular vigour, the mental acuteness, will improve for a short period; and on their subsequent decline, may again be augmented by another transition. To this cause I would attribute the temporary advantage, often derived from a vegetable diet; as in the cases mentioned at p. 62. The principle is illustrated by an account of a Shopman, given in Dr. Lambe's Reports. From his situation, this youth was obliged, at an early period, to live chiefly on vegetables. His health was not robust. At the age of 16, his diet contained a considerable proportion of animal food. "The consequence was, that he improved considerably in strength and in appearance; and as he expresses it, he thought himself becoming quite a hearty lad. This increased strength and apparently improved health lasted nearly two years. After this, it began to decline. Though the diet continued unchanged, the strength diminished; and he is certain, that now, at the age of twenty-one, he is not so strong as he was three years ago, at eighteen. He is not now able to raise weights which he would do then". At the age of 18, moreover, he became affected with scrofula. It appears to me that the young man erred, not as Dr. L. would argue, in adopting a nutritious diet, but in maintaining that diet, when the system was fully charged, when his muscular exercise, and the attendant increase of secretion, were not proportionate to the supply of blood, and when, probably, the great period of growth was passed. When a person's health droops without evident cause, let his alimentary canal be cleared, and diet considerably changed. If his food have been

high, he will be more vigorous on the vegetable regimen; if it have been low, he will derive still greater advantage from the transition to flesh. Occasional variations, also, in the individual articles of diet, are advantageous to persons of weak digestion. The stomach, even in health, loathes the best dish, if presented at every repast; and in a state of debility, can seldom bear its simple repetition. The principle of change in diet, merits more investigation than it has yet received. Hereafter, it will probably constitute an essential part of the treatment in some chronic diseases.

The **QUANTITY OF FOOD**, necessary for the sustenance of the body, cannot be stated with accuracy. No absolute rule can be made, either for individuals or men in general. Much, of course, depends on the quality of the food, on the particular state of the digestive organs, on the degree of muscular exertion, especially in the open air, on climate and the season of the year. The stomach itself,—the call of appetite, would be the best director. But the stomach, as was urged on a former occasion, is rarely in a natural state. Stimulated so frequently with condiments and alcohol, its desires are artificial, and cannot, therefore, correctly indicate the necessities of the general system.

But our want of precise direction, is scarcely to be regretted, till our mode of living approach nearer to what we know to be right,—what we commend in a lecture-room, but forget at the table. We almost all err on the side of excess, and this neither from defect of judgment, nor of facts for judgment to examine.

Half our diseases arise from faults in diet, and the common fault is that of *quantity*.

Excessive nourishment is the general state of Englishmen. We take richer food than our habits require; and thus our vessels are loaded, either with blood in excess, or with a fluid but partially assimilated. Hence probably our greater danger from disease or accident; the greater blood-letting and evacuations, which our maladies require; and the higher fever which injuries occasion. In reading the memoirs of French Surgery, we find numerous instances of patients restored by the efforts of nature from states, which in similar circumstances, would be fatal to Englishmen.*

The system of repletion commences in infancy.

* Baron Larrey's works abound with details which illustrate this statement. At one of the bullfights in Spain, a French soldier, half-drunk, threw himself into the arena to contend with the enraged animal. He was soon impaled by the bull's horns, and tossed to a considerable distance. The animal was immediately killed by one of the combatants; and the Baron rushed into the arena. He found the soldier insensible; and the wound extending from the groin across the pelvis, the bull's horn having even injured the bladder. Yet the patient recovered without any untoward symptom, and, it appears, with little medical attention. "A chasseur of the ex-garde was struck in the upper and outer part of the thigh by a Cossack's lance, while in the act of a cavalry-charge, the point of the lance glancing upwards and inwards, passing the inguinal glands, under the crural arch, and penetrating the bladder." A discharge of blood and urine,—abscess, and fistula succeeded; yet the man recovered, without, it appears, any great constitutional disorder. A young corporal received a musket ball in his chest at the battle of Moillou. He fell insensible on the spot, and remained two days on the field, threatened all the time with suffocation. At length he was removed to a hospital, where he was on the point of perishing from an enormous hemorrhage in the chest. An enlargement of the wound saved him at this period. He was removed to other hospitals, where for four years he dragged on a wretched existence; the ball was not extracted, and a large suppuration continued from the fistulous abscess. At length the Baron removed part of a rib, and with much difficulty extracted a ragged Russian bullet, which weighed an ounce and a half. Considerable fever ensued; but it was reduced by slight local bleeding. A few days afterwards, the unfortunate patient, by a sudden incurvation of the body, fractured the remaining portion of the rib, and ruptured the intercostal artery. The consequent hemorrhage brought him once more to the brink of the grave. The dying man was re-

The child cries; the nurse gives food to soothe its irritation; this food, though unnecessary and injurious, oppresses the feelings into temporary quietude. But disorder of the stomach is the necessary result; the load of indigested matter excites irritation; the child cries again; the nurse and grandmother are sure it wants something to eat; and of course some nice rich food is freely administered. Surely a routine like this, must greatly impair the digestive function, and with it the vigour of the system. If the quantity of food,

vived with cordials. Putrid fever supervened, and hospital gangrene appeared on the wound. An emetic was administered. "From this moment he felt himself better, and went on rapidly to convalescence and recovery."

"It is to be remarked," says Sir George Staunton, "that the Chinese recover from all kinds of accidents more rapidly, and with fewer symptoms of any kind of danger, than most people in Europe. The constant and quick recovery from considerable and alarming wounds has been observed likewise to take place among the natives in Hindostan. The European surgeons have been surprised at the easy cure of sepoys in the English service, from accidents accounted extremely formidable." The low diet of the Hindoos and Chinese is well-known.

Take a story related by the worthy and garrulous Cornaro. "I happened, as is often the case, to be in a coach, which going at a pretty smart rate, was upset, and in that condition drawn a considerable way by the horses, before means could be found to stop them; hence I received so many shocks and bruises, that I was taken out with my head and all the rest of my body terribly battered, and a dislocated leg and arm. When I was brought home, the family immediately sent for the physicians, who, on their arrival, seeing me in so bad a plight, concluded that within three days I should die; nevertheless, they would try what good two things would do me; one was to bleed me, the other to purge me; and thereby prevent my humours altering, as they every moment expected, to such a degree, as to ferment greatly, and bring on a high fever. But I, on the contrary, who knew, that the sober life I had led for many years past, had so well united, harmonized, and disposed my humours, as not to leave it in their power to ferment to such a degree, refused to be either bled, or purged. I just caused my leg and arm to be set, and suffered myself to be rubbed with some oils, which they said were proper on the occasion. Thus without using any other kind of remedy, I recovered, as I thought I should, without feeling the least alteration in myself, or any other bad effects from the accident, a thing which appeared no less than miraculous in the eyes of the physicians. Hence we are to infer, that whoever leads a sober and regular life, and commits no excess in his diet, can suffer very but little from disorders of any kind, or external accidents."

urged upon the irritable stomach of the child, were compared with that taken by an animal, of like size, in a state of nature ; our habitual excess, I believe, would be quite apparent. An immense number of the human race, it is well known, die in infancy ; and of these, the majority are the victims of repletion. That much, moreover, of the disordered digestion of the adult, is remotely produced by the faults of early life, we can readily suppose. When we reflect, that almost all infants are fed in excess, that the functions and desires, at all times remarkably influenced by habit, are particularly so in early life, we shall be inclined to believe, that the depraved or intemperate appetite, which strongly impels us to daily improprieties in diet, has not unfrequently its origin in the nursery.

While growth consumes much of the extra-nutrimment, the disorder may be only latent ; but when the body has acquired its full developement, excessive diet excites into action the morbid disposition acquired in childhood.

It would amuse the inhabitant of another Planet to observe how the sons of Earth reason and act on this misconduct and its effects. We load the stomach with a compound mass of strong food and various condiments ; the organ is in a state of morbid excitement ; we complain of feverishness ; and then we take wine or spirits, to improve digestion. We overburden the stomach, gorge the vessels, disorder the nervous system ; and then we complain of languor and weakness, of “ debility of the stomach.”—For this *debility*, however, we are commonly wise enough to employ *evacuant* medicines.

But nature begs us to lighten our stomach, rather by withholding half our accustomed dinner, than by swallowing a nauseous dose. Reason directs us to remove the cause, rather than the effect ; and, instead of seeking relief from the surgeon's lancet,—to cut off the excessive supply of nourishment,—to load the blood-vessels with no more than they can easily carry,—and thus to let the heart play freely, the lungs expand, the brain act without effort.

“ But,” says a lusty person, “ my head is habitually oppressed, and I pant on the least exertion, yet I eat less than most.” Very probably. But do you remember that individuals vary considerably in their digestive power ? A quantity of food may be excessive to one, which will scarcely support another. Your digestive organs are perhaps so vigorous as to extract a large quantity of chyle from a small quantity of aliment. The quantity of your food may be absolutely small, but relatively great. Hence, to remove obesity or fullness of the bloodvessels, your diet must be reduced, in the inverse ratio to the vigour of the digestive organs.

This principle is evidently applicable also to the *habits* of individuals. In a former part of this lecture, I urged the importance of accommodating the *quality* of diet, to the exercise we take in the open air. With equal propriety, I may urge an attention to the *quantity*. You will remember that the mass of food, taken by the laborious countryman, is excessive to the sedentary artisan ; that the gentleman on horseback, and the gentleman in the library or the counting-house, may, in re-

gard to the quantity of food, be considered animals as different as the hound and the lapdog.

Another practical error may here be noticed. Sportsmen often pass the day without food, and in the evening, to renovate their strength, devour a hearty dinner. Need I remark, that the whole nervous system is exhausted by the day's exertions,—that the energy of the stomach is consequently in a state of great reduction? Need I add, that an excessive load on a debilitated organ, is not the way to restore its vigour, or that of the system at large, to which its agency is so important? In fact, an attack of Dyspepsia is no uncommon result.

When Fasting has amounted to starvation, a full meal is highly dangerous. The long privation of stimulus which the stomach has suffered, makes that excessive, which in ordinary circumstances would be proper. A common repast is here almost a poison. Hence, flesh devoured by the famished sailor, has produced raving madness and speedy death. A bason of broth will intoxicate a hungry man.

Delicate persons are often said to require good support. This is true or false, according to the definition of the terms. If by “good support” be meant a proper quantity of chyle, elaborate, unadulterated, and formed without fatigue or injury to the digestive organs, the opinion is correct. But if by “good support” be meant a large quantity of aliment, forced upon these organs, whatever be their state;—the stomach, for instance, with healthy or depraved Gastric Juice, the Liver secreting well or secreting amiss, the Bowels irritable or torpid,—if, I say, nutritious food be pressed

upon organs, deranged or inactive, the notion is quite erroneous.

We should remember that the real nourishment of the body depends upon the vigour of the digestive organs, rather than on the quality or quantity of the food ; that aliment, though excellent in kind, and, to most persons, small in quantity, may so far exceed the existing power of the individual stomach, as to be not only useless, but positively hurtful. The digestive fluids will act but on a limited mass, a mass varying in different individuals, and at different periods. All beyond this quantity, undergoes common chemical changes, or excites bad secretions. The food seems to ferment in the stomach ; gas and vinegar are generated ; fluids, crude or baneful, are taken up into the blood,—producing disorder of the system, and often considerable fever. Superfluous food, moreover, in all cases exhausts the nervous energy, without the least advantage. The strength is expended in ridding the system of a mass of “ good things,” which can never be digested.

It is particularly important, that convalescents from disorders in which the appetite has been long suspended, should be lightly fed,—the aliments, moderate in quantity, as well as mild and digestible. Inattention to this obvious maxim has occasioned many a fatal relapse. Relatives and Nurses are so anxious to support the reviving flame, that they choke it with fuel.

Man is not fed solely by his food. Aliments are not, I believe, even his principal sustenance. Air is far more important. In the preceding Lecture, I referred to several instances of remarkably reduced diet, and to observations which prove, that many of the lower ani-

mals can thrive on air and water, as their only support. Analogy, no less than experiment, authorizes the opinion, that man, with a proper physical education, would subsist in health and vigour on half of his ordinary aliment.

A lusty young woman, during three months of illness, but without fever, did not take (according to the statements of her relatives) more solid food in that time, than was equal to one penny-roll; yet her bulk did not decrease. "In some cases," says Heberden, "though all the food seemed to be vomited, the patients have thriven and grown fat." I could adduce several instances, also, of ordinary health enjoyed on a diet greatly reduced. A stout and fresh-looking young female from the North of Yorkshire, assures me that the food she takes, does not, on the average, exceed the smallest roll of bread per day. Occasionally she eats a little meat, but then her vegetable aliment is proportionately reduced. Tea is her common beverage; Milk she rarely takes; Malt-liquor, never; and Wine, in no greater quantity than two or three glasses in the week. This has been her diet for two years. For the first, she was in much better health than before the reduction of food; lately she has been indisposed; but not, it appears, from defect of nourishment. It is worthy of remark, that her sleep seldom exceeds four hours, in the day and night.

The advantage of reducing the quantity of food is exemplified in a narrative, taken by Dr. Lambe, from Schenck's collection:—"The noble Francis Pechi, when he had mounted his mule, to dispatch some commissions of our

illustrious Duke,—a man of 50, gouty, and much oppressed with the continual torments of this disease, was secretly thrown into prison by a certain Marquis; his wife, only son, and other people, thinking him dead. In the year 1556, after a lapse of 20 years, he was found by the French, who took the citadel, and to the astonishment of all the inhabitants of Vercelli, preserved like Lazarus from the tomb, he walked through the city, with his sword by his side, without stiffness of his joints, without the aid of a stick. He thus escaped all the misery of the gout by means of a slender diet, imposed on him by his gaolers; and finding his wife and son dead, he began to claim his houses, farms, and other property, which had been sold and were of great value. In diet, therefore, is the medicine.”

The increase of cheerfulness and the improvement of intellect have been occasionally produced, as I before allowed, by a vegetable diet. But the effect is far from universal; and observation warrants the opinion, that these, not less than the other advantages of the herbivorous regimen, may be obtained, with more certainty and less inconvenience, by a reduction in the quantity of the mixed diet. I may adduce the statements of the “noble Venetian,” though tinged by an amusing senility. His spirits were remarkably cheerful; he delighted in the scenery of nature, and the productions of art; was zealous and active in his country’s welfare; full of benevolence, and of self-complacence. “How gay, pleasant, and good-humoured I am; how free from every perturbation of mind, and every disagreeable thought; in lieu of which, joy and peace have so firmly fixed their

residence in my bosom, as never to depart from it."

He enjoyed reading and literary conversation : he wrote eight hours a day : nay, at the age of 83, " I have been able" says he, " to write a very entertaining comedy, abounding with innocent mirth and pleasant jests."

This buoyancy of mind and spirits, so rare in advanced life, he justly attributed to the reduced quantity of his aliments.*

The Hermit derived from his restricted diet, not only health, but I conceive also, those pleasures of imagination, which only could compensate the want of social intercourse. Pleasant dreams, it is well known, may be obtained by attention to food and habits ; and it is probable, that the raptures and visions of happy enthusiasts, were, in no small degree, dependent on their scanty diet. I recollect no instance of a happy enthusiast being a gormand or an epicure.

We wish to live, not only as long, but as *much*, and as happily, as possible. A man whose brain is oppressed, scarcely lives as an intellectual being ; a man with a nauseant stomach, has not even animal enjoyment. Yet we start at the idea of being confined to a system of temperance, as if it were confine-

* A Mechanic, whom I attended, some months ago, in a severe inflammation of the Brain, took no food for several days. During this period he enjoyed great self-complacence. He often exclaimed, " I am a greater man than Achilles ;" " Oh, what a mind I have !" He became extremely animated. His thoughts were engaged alternately with Astronomy, Poetry and Mechanism. He even invented a machine, which other persons had fruitlessly attempted. This increased vigour of mind, I attribute chiefly to the excitement of the cerebral blood-vessels : but it is worthy of remark, that subsequently as he took food, his intellect proportionately declined. He now assures me, that his mind was never so powerful either before or since his illness, and he dwells with pleasure on the Elysian scenes which his imagination displayed. The reduction of diet, *he* conceives to have been the *principal* cause.

ment in a House of Correction. We have a vague, but appalling notion, that it abridges the enjoyments of life. But, if this notion be brought to the test of fact and reason, we shall assuredly find, that Temperance not only lightens and cheers the major part of the day,—the great bulk of our existence,—but promotes even the pleasures of the table.

After the statements in this Lecture, a reflecting person will thus reason : “ I am intent on happiness. I know by my daily feelings, by a thousand events, that happiness does not rest on external circumstances. I find that the vigour and enjoyment of life depend on the energy of the nervous system. My object, then, is to have this energy as great as possible, and in a state the most disposable. It cannot be great, where the grand centre of the nervous system is oppressed : it cannot be in a disposable state, when the digestive operations make an habitually great demand. My diet and habits shall be directed by rational principles. I will not clog the blood-vessels with an excess of nourishment : nor excite the brain and nerves with unnecessary stimulus : nor waste their powers in ridding the system of what it should never have received. My food shall be plain, and in *half the usual quantity*. But I will take care, that my stomach have such aliments as afford the requisite nourishment with least effort. It shall not labour on an exclusive diet of grain and roots, while I can procure substances more nutritious and digestible. I will take such proportion of *flesh*, as comports with my situation and habits.”

The subject of COOKING must not be wholly overlooked in a Lecture on Diet. Man has been termed a “*cooking* animal.” The practice, indeed, is peculiar to our species. May it not be considered a substitute for the agency of that glandular apparatus, which the stomachs of brutes so generally possess? The *human* stomach, indeed, was represented in the last Lecture with minute excavations, numerous as the cells of a honey-comb; but these Follicles must be far less powerful, than the glands of many birds and animals, which take similar food. Man may be supported on the same substances which feed a Fowl or a Rat. He has a simpler apparatus, but the faculty of cooking is an adequate compensation. Cooking is chiefly useful in eliminating noxious principles, and rendering the food pervious to the digesting fluids. Of both these operations, the treatment of the potato affords a familiar example. You are aware that this plant, in common with others of the genus *Solanum*, is poisonous. The herb is decidedly deleterious; and the root, if eaten raw, would considerably disorder the human stomach. In its natural state, moreover, its compact texture would prevent the full digestive operation. Both these evils are removed by cooking. Heat dissipates the narcotic principle; and renders the potato mealy,—easy to comminute, and ready to absorb the animal juices. Cooking seems especially necessary for vegetables. Farina, the chief nutritious constituent of this class, in cold solution forms a viscous fluid, but is coagulated by heat. A tenacious fluid

of meal and water is scarcely affected by the human stomach; a coagulated substance is digested with ease. Hence, as Fordyce observes, in almost all countries, however savage, where fire can be readily procured, the inhabitants use heat for the preparation of their mealy vegetables. In respect to animal food, cooking, though perhaps not essential, is an important auxiliary to digestion. Some articles could not otherwise be dissolved. Bone would not yield its nutriment without artificial preparation. Flesh and other soft parts are also improved by cooking. Hunter observed that “boiled and roasted, and even putrid meat is easier of digestion than raw.” Eggs, like milk, must be coagulated, previous to digestion. Heat saves the stomach the labour of this coagulation. Yet raw eggs are commonly supposed more digestible than those which are boiled or fried.

Cooking, then, so far as it dissipates noxious ingredients, or renders the food susceptible of digestion, appears highly advantageous. “If,” says the author of *Peptic Precepts*, “the secret of *rejuvenization* be ever discovered, it will be found in the kitchen.” But at present, cookery tends to reduce, rather than increase, the vigour and duration of life. It is devoted to the gratification of the palate, at the expense of the stomach. Variety and complication of viands are particularly studied;—with the aim, one would suppose, of urging digestion to the greatest point of repletion.* High cook-

* I take the liberty of extracting a passage from the letter of an able Physician, though I cannot accede to his opinion. “I know not when men first began to prepare their food for mere gratification in eating;—but I am of opinion that

ing, therefore, and compound dishes, cannot in general be reprobated too much. There are, however, occasional exceptions. Variety in the articles of food, is sometimes desirable. The fact is established, that the stomach will digest a compound mass with more ease, than a like bulk of one substance. When, therefore, the power of this organ is greatly reduced, the meals should consist of several ingredients, or of compound dishes.

The importance of Mastication is apparent from an experiment of Spallanzani's. He placed in perforated globes, two pieces of flesh, each weighing 45 grains; but the one portion was masticated, the other not. The globes were swallowed, and on their ejection, the first contained 4 grains, the second (of unmasticated flesh) retained 18 grains. Complete mastication is requisite both for the comminution of the food and the free effusion of Saliva. It is obvious, that this solvent fluid can never be intimately blended with the aliments, when they are eaten in haste. Slow ingestion is important also as it regards the calls of appetite. The first symptoms of satiety are not perceived when the meals are hurried: for the actions of the stomach are slow, and her remonstrances at first indistinct and feeble. Hence she is so often loaded with food, which she cannot digest. "This," said an intelligent friend, "is indeed my own case. I eat fast, not from haste,

one of the earliest sins of our first parents was *cooking*;—and were I capable of practising what I preach, I would certainly eat all my food wholly unaltered by fire or fermentation."

but from habit ; and repletion is the daily result. If my dinner occupied twice its present time, I should eat only half the quantity." The man of business swallows his meals without thought, and even without enjoyment. He hastens back to the warehouse ; and after a time, is convinced by the oppressive or gnawing sensation at the stomach, that he has eaten too much, or in an improper manner. But the impression is merely for the time. He forgets the annoyance of yesterday, and disregards the hints of to-day, till temporary, but repeated irritation of the digestive organs, lays the foundation for permanent disease.

The *periods of eating* deserve some attention. The habit, which leaves the great bulk of the day without a meal, and then crowds two or three on the evening, is manifestly bad. Heavy suppers are generally improper. They cannot be digested before bed-time ; and the operation of the stomach must be imperfect, when the nervous functions are reduced or abolished. The number of meals, which generally suits the digestive organs, is three or four in the day. "Eat little and often," is a common direction to weakly persons. This, like many other observations, is repeated oftener than it is examined. The practice of frequently taking scraps of food, keeps the gastric glands in excitement and thus weakens their secretion ; it breaks in upon the round of digestion ; and habituates the stomach to propel its contents scarcely affected by the gastric juice. So far, therefore, from augmenting, it considerably impairs, the nourishment of the body. Some states of the stomach, indeed, may require frequent

ingestion ; peculiar situations may oblige men to eat often, and the organs, after a time, may accommodate themselves to the practice. A curious example was related to Stark by Franklin. "A gentleman, having been taken by the Barbary Corsairs, was employed to work in the quarries. The only food allowed him was barley, a certain quantity of which was put into his pockets every morning. Water he found at the place of labour. His practice was, to eat a little now and then, whilst at work ; and having remained many years in slavery, he had acquired so far the habit of eating frequently, and little at a time, that when he returned home his only food was gingerbread-nuts, which he carried in his pocket, and of which he ate from time to time."

Extreme reduction of the system also, often induces the medical attendant to pour in food or liquors every half-hour. But it is apparent that this and the preceding observation by no means countenance the habit of frequent eating.

On the other hand, the intervals between meals must not be too long. You are aware that the digesting fluids flow in varying quantities. At certain periods the gastric juice is copiously effused ; and to employ it, hunger calls for food. If the call be disregarded, the digestive solvent must either be taken back into the circulatory system, or left to irritate and exhaust the nerves of the stomach. Accordingly, on deferring a meal, we find the appetite less, and digestion imperfect.

The proper interval may be stated at from four to six hours.

My first Lecture adverted to the diminution of ge-

neral activity, the listlessness of body and mind, which occurs during laborious digestion. The well-known experiment of Professor Harwood, is generally urged, as deciding the propriety of repose after eating. A Pointer, immediately after a full meal, was hunted; a similar dog, after a full meal, was allowed to lie down in his kennel. Both were killed after an equal lapse of time. In the quiescent dog, digestion was found to be greatly advanced; in the hunting dog, scarcely commenced. It is hence apparent, that violent exercise suspends digestion in dogs; and we may fairly infer, that it has the same effect in man. But it is rather surprising that dietetic authors have been content with this experiment, and have also urged the deduction beyond its legitimate extent. It properly forbids only *violent* exercise; a practice, which no one adopts. The question is, Does *moderate* exercise preclude digestion? I have made some experiments on the subject; and I find the process rather impeded, but certainly not prevented.*

The universal habit of labourers, in resuming their

* 1. To a hungry dog was given three ounces of food, flesh and bread in equal quantities. The animal was *kept walking* for three hours, and then killed by pithing. The contents of the stomach, though copiously moistened with Gastric Juice, were *two drams less* than the food eaten. We may, therefore, infer, (as the Gastric Juice would add considerably to the weight) that from one-sixth to one-fourth had been digested. The major part of the aliment was little changed in appearance. 2. Another dog was fed in a similar manner, and suffered *to be at rest*. At the end of three hours, on examining the contents of the stomach, we found them not more changed than in the preceding experiment, but *three drams less* than the aliment. 3. An experiment similar to the first, except that the animal was kept *in easy motion for four hours*. The contents of the stomach weighed *four drams less* than the food eaten. They were universally pervaded by the Gastric Juice, and the bread was entirely broken down. 4. In the next experiment a large dog, fed in the usual manner, was kept *at rest for four hours*. The contents of the stomach did not weigh three drams. Digestion consequently, was *almost complete*. If this animal had not been much larger and stronger than the others, perhaps the two last experiments would have *more nearly approximated*.

employ soon after dinner, confirms the inference from experiment. If digestion must wait for the repose of the body, their meals would remain in the stomach for five or six hours; and gastric disorder would ensue. The argument I need not pursue. I would remark, however, that the conclusion applies only to the healthy organs, acting on a moderate quantity of aliment. If either the organs be weak,* or the food excessive, repose is necessary to digestion. Hence, the Dyspeptic is advised to sit an hour or two after dinner, with no other occupation than conversation or a light book. Either mental or muscular exertion would draw off that nervous energy, which digestion demands. A jolting motion is particularly injurious. It displaces the food, and interrupts the action which should subject successive portions to the Gastric Juice.†

* This observation seems to be illustrated by the following observations. To a hungry dog was given three ounces of food, flesh and bread in equal quantities; and a lad was employed to keep him walking for *two hours*. The animal was then pithed. We found no mark of the digestive agency, except in the effusion of Gastric Juice on the circumference of the food. The villous coat of the stomach and intestines was not healthy. A young dog was treated in a similar manner. The food presented scarcely any mark of digestive agency. The villous coat of the intestines had an ochrous hue, and seemed to be preternaturally thick. It was lined with a dirty white substance. In experimental inquiries, it is important to remember, that dogs are often diseased. Worms are commonly found in the intestines.

† It is true that the stomach embraces its contents, and never has a considerable vacuum: but if it be thence argued, that since shaking makes no change in a full vessel, as to the situation of its contents,—the food in the stomach must remain unmoved by the motion of the body,—I reply, with the observation of Philip, that the analogy is correct only, as it regards a vessel filled with substances of similar gravity. Fill a vessel with flesh, water, and gas,—agitation will immediately change their relative situation. In the strong stomach fed with solid food, great exercise might suspend, but would not impair digestion; because here there is no considerable difference in the gravity of its contents: but if such exercise were taken by one whose stomach secretes gas, or allows the food to undergo improper changes, digestion would be defective, not only from a want of nervous energy, but also from mechanical agitation. The Countryman may rise from his hearty dinner and ride, without inconvenience, a rough-trotting horse; but if the delicate Townsman were to follow his example, he would be a prey to indigestion for hours.

The next subject for our examination is, **DRINK**. When we consider how large a proportion of the body is fluid, and how this is thrown off continually by the secretions, we see the necessity for some considerable source of supply. Drink first suggests itself as the source in question ; but other means, though less apparent, are scarcely less operative. I refer especially to absorption from the atmosphere, a function which will be noticed in a subsequent Lecture.

The wants of the system are expressed by the appetites ; and a deficiency of fluids is strongly indicated by the calls of Thirst. Drink, in general, is only requisite in obedience to these calls. With food it is seldom necessary ; for Hunger and Thirst, as Abernethy observes, seem to be naturally incompatible.

Much fluid, by diluting the gastric juice, impairs digestion ; and many are the instances of Dyspepsia, which are aggravated, if not produced, by this common error.

Nor is the evil confined to copious draughts. Frequent sipping, by moistening the food, precludes the due admission of saliva, and sends the mass, without proper mastication, to the stomach. Thus the habit both hurries ingestion, and substitutes water for one of the solvents of food. It also excites the appetite to take more than the system requires.

An instructive case is recorded, in the Medical Transactions, of a miller, who, growing extraordinarily fat, and suffering in consequence great indisposition, had the resolution to adopt a new system of diet. First, he gradually reduced the quantity of his food ; next, he

abstained wholly from flesh and fermented liquors ; and finally from every kind of drink. His constitution, sinking under the oppression of habitual intemperance, was surprisingly relieved ; he became healthy and cheerful : and so marked was the change, that numbers of persons of all ranks, consulted him on the mode of following his happy example. He died at the age of 64 years ; for the last 17 of which, he had never taken a mouthful of liquid. We are not, however, to infer from this case, that the total abstraction of drink is generally advisable.*

Of simple drinks, the best is undoubtedly that which nature has liberally provided. But the varieties in its quality deserve some attention. Water, largely impregnated with earthy and mineral substances, cannot be generally proper, and many diseases have been ascribed, with great probability, to the obstructions it produces. The salubrity of some districts, Wharfedale for example, seems dependent on the purity, not less of the water than of the atmosphere. Where good water is not to be procured from the stream or the spring, the use of the Still would be worth the trouble.† From the reports of Dr. Lambe, distilled water appears to have

* The Dog, whose organs resemble those of Man, requires little water except in the heat of Summer. Rabbits and Ferrets, though they readily take drink when offered, can generally live months without it. " Having condemned water," says Dr. Lambe, " and attempted to show experimentally its noxious influence upon the system ; having condemned spirituous and fermented Liquors, from the authority of the most enlightened medical writers, and the common experience of mankind, it must follow, that there is no species of drinking which I approve. And indeed, I have already ventured to assert, that all drinking is an unnatural habit ; in other words, that man is not naturally a drinking animal." This is matter of *opinion*.

† I regret that a communication, with which I was favoured by Dr. Alderson of Hull, did not reach me in time to be noticed in its proper place. It states

an important agency in the reduction of some chronic diseases. Acids, added in small quantities to the drink, are generally proper. The solution of super-tartrate of potass with lemon juice, as in the form of imperial-water or ginger-beer, is a good diluent. Vinegar is exceptionable. In large quantities it has been found to disorganize the stomach.* In some disordered states of digestion, soda-water is an excellent drink, and obviously preferable to acidulated fluids. I have mentioned liquids chiefly as diluents. Are they also nutritious? An affirmative reply seems authorised by common feeling, and still more by the

the circumstance of "a friend, who has, for a long series of years, uniformly continued a plan of water-drinking and a vegetable diet, which he adopted on mature reflection, being fully convinced that the contrary mode was mere luxury and indulgence. His children are living evidences of the good effects of such a plan: there cannot be a handsomer, a stronger, or a better family; they possess every physical power in perfection, being tall, comely, finely proportioned, patient of fatigue, capable of the greatest exertions, and excelling in every gymnastic exercise,—without ever having tasted animal food or fermented liquors. They have very seldom even required the aid of medical men: they fear not the effects of the common epidemics, nor have they ever suffered from acquired diseases."

* Take a case stated by Haller. The subject "was corpulent, and being by profession an architect which obliged him to use a good deal of exercise, the weight of his body was very troublesome to him. He had been advised to use acids, and even vinegar, nay perhaps some mineral acids or other; and after having strictly complied with this prescription for above a twelvemonth, he found a gradual diminution of his burthen indeed: but the remedy did not stop here, for he fell into a consumption, and from a corpulence which was only inconvenient, he was reduced to a fatal marasmus, nauseating food, and throwing up whatever he eat or drank. I opened the body after he died, and stole away the stomach, for it was really worth the while, being a membranous bag, and scirrhus. Its thickness about the œsophagus, and at both the arches, where it is continued in the gullet, was not less than two inches, composed of layers of membranes, with large vessels running between them. Thus it appears, that however healthful acids are to our bodies, and seem designed by nature to preserve our animal food from putrefaction, the excessive use of them is extremely noxious, coagulates the blood in the vessels, and likewise the Lymph; the coagulation of which last chiefly appeared from the white flesh of the scirrhus stomach."

cases of those, who have lived long without solid aliment. Simple water seems to be food; and water impregnated with carbonic acid gas, some observations lead me to suppose more decidedly nutritious. The infusions and decoctions of aliments* yield considerable nourishment. Yet Philip remarks, "that the strongest decoction of beef, so far from nourishing, will not, if unmixed with something solid, even allay the appetite." In this remark there must be some fallacy, for broths and soups both allay the sense of hunger, and give muscular vigour. Magendie found that the water of these aliments is absorbed by the stomach, and the gelatine, albumen, and fat, treated as ordinary food. In some debilitated states of the digestive organs, soups are very valuable; and where it is desirable to afford speedy nutriment, with gentle stimulus, they are preferable to solids. But under their general use, as the basis of diet, the body decreases in bulk. Milk is well known to be coagulated in the stomach, prior to digestion. The whey is taken up by the absorbents; and the curd, like other aliments, subacted by the gastric juice, and forwarded into the intestines. The valuable properties of milk have before been cursorily noticed. Skim-milk, either cold, or heated to a little below the boiling point, is the best fluid for breakfast. New milk, from the cream it contains, is generally oppressive to persons of weak stomach. Where milk alone disagrees, the addition of lime-water sometimes

* "Dr. Priestley gave to a Cow, for some time, a strong infusion of Hay, in large quantity, for her drink, and found that she produced, during this treatment, above double the quantity of Milk."

promotes its digestion. Warm whey, taken at bedtime, is useful in exciting perspiration, but it is scarcely to be considered as food. Curd is an useful aliment, when the constitution is disposed to fever. Butter-milk deserves to be more generally employed. It often remains on the stomach, when all other food is rejected.

Cocoa and Chocolate have not, I believe, been particularly examined. In nutriment, they are probably much inferior to milk. The oil, with which they abound, often renders them oppressive to the stomach; but where this effect is not produced, they are preferable to tea.

Malt liquor, containing a quantity of sugar, is considerably nutritious. It is proper for persons of active employ; and for some delicate individuals, it forms a particularly valuable aliment. To the plethoric or indolent, it is decidedly injurious. It oppresses the stomach, induces heaviness of the head, and a diminution of mental and corporeal activity. The effects of this liquor, taken in excess, will be noticed in a future Lecture, when we discuss the agency of Wine and Spirit.

Tea is a narcotic, and hence naturally injurious; but experience scarcely warrants our attaching to it a high degree of evil agency,—at least, in the common way, and to the ordinary extent in which it is taken. I know not what the citizen could advantageously substitute. It appears well calculated to obviate the effects which arise from the excess of food, and the inordinate stimulus of spirituous potation. Black tea, drunk in moderation, produces in most persons, effects rather useful than prejudicial. It evidently gives

a mild impulse to the circulation, and excites a genial moisture on the skin. A cup of Tea, taken an hour or two after dinner, will frequently relieve an oppressed stomach. When disagreeable feelings ensue on our morning's or evening's repast, they arise less frequently from the Tea, than from the Butter, with which the Bread is besmeared. The cold infusion is a grateful drink in states of febrile excitement. With Sportsmen, also, it is a favourite beverage.

Most of the highly flavoured Teas excite the nervous system; and when taken in large quantity, or at an improper time, produce great disorder. The Green seems to have most of the narcotic property. Its sedative effect on the heart is sometimes alarming.*

The properties of Coffee have been disputed. We need not examine all that has been written on its beneficial and baneful effects. Daily experience is our guide. Coffee is a narcotic stimulant. It removes the sense of fatigue and exhaustion, and it gives vigour and hilarity to the mind. The wearied student, the brain-racked

* In the Dublin Hospital Reports, is detailed the case of a gentleman, who, as he walked some distance along the Coast of Devonshire one Summer's day, took strong Green Tea, with Bread or Biscuit, as his only food. He bore his journey well, and felt no inconvenience from his diet. At night he retired early, but soon suffered an uneasiness at the heart, as if on the verge of fainting. The urgency of sleep, however, caused this sensation to be disregarded, and he passed two hours in troubled slumber. His respiration became irregular and oppressed; and the heart sometimes palpitated, sometimes seemed motionless. At length he awoke suddenly and entirely, as from a struggle of nightmare. He now experienced acute pain, as from spasm, in the region of the heart; and in spite of all his efforts, he seemed constantly falling into a fainting fit. His pulse was feeble, irregular and intermitting, in an extraordinary degree. With difficulty, he roused his servant at the Inn, where he lay, and procured some pills of opium, and a small quantity of cold brandy and water. Deriving some temporary relief from these remedies, he again composed himself to sleep; but after an hour's slumber, almost as distressing as

inquirer, hails it as his comforter and support. Voltaire almost lived upon Coffee; the great Harvey took it constantly and freely. This was the habit, too, of Horace Walpole. Indeed, to many scientific and literary men, the Coffee-cup is the regular companion of the Ink-stand. These Coffee-drinkers, however, sometimes suffer serious disorders of the stomach or the head, as indigestion,* nervous irritability, head-ache, or palsy. But the proportion of evil, which results from the Coffee, cannot be accurately compared with that which results from the study. Nor does the ardent student care to inquire. He knows that strong Coffee assists his intellect. He is not the servant of his stomach, nor will he consult its likings at the expense of a more noble organ. Here he is in error. He forgets the sympathy between the stomach and the brain. But ere long he will be taught it, in a way not the most agreeable, either to his intellectual powers, or his corporeal feelings. Fretting of the stomach, and consequent irritability of nerve and of temper, will soon be as trou-

that which he had before endured, he awoke in great agitation, gasping for breath, and bedewed with a chilly moisture. Another pill of Opium was procured, and a glass of hot brandy, stronger than the former. From these he soon derived the wished-for relief, fell into a sound sleep, and awoke in the morning in perfect health.

An analogous case was communicated to Dr. Percival, by Dr. Harvey. "Upwards of 30 years ago," says Dr. H. "Dr. ——— called upon me in the middle of the day, in the summer season. He appeared under the influence of great terror, and upon my asking the cause, he said, 'I have to request you will let me in, and allow me to die in your house.' When he sat down, I felt his pulse, and found it scarcely discernible and very irregular. Something led me to ask him if he had been drinking strong Green Tea. He replied in the affirmative." A glass of Cherry Brandy was administered, and the anxious sufferer put to bed. He slept two hours, and awoke refreshed and well.

* Coffee has been recommended as assisting digestion. An opposite effect, however, I have often experienced, when a strong decoction or infusion has been taken soon after dinner.

blesome as impertinent visitors, and equally disarrange his ideas and break the catenation of thought.

The importance of the subject of diet, and its immediate application to the health and comfort of every individual, have led me into a considerable length and labour of detail.

Errors in diet, are the great source of disease : amendment of diet is the basis of recovery. The majority of our maladies, medicine may relieve or suspend ; but, without the aid of regimen, can never cure.

From the statements in this Lecture, the reader may deduce a few general rules for the diet of persons of different ages and situations.

Infants, it is obvious should have milk and bread, with a moderate proportion of sugar : the quantity of food less than usually given.

Young persons require full meals of mild and nutritious food, as fresh mutton or beef, with bread and few other vegetables. Ripe fruit may be eaten without restriction. Condiments they should use but sparingly. They must guard against the habit of taking drink, when thirst does not demand it.

Persons of the middle period of life should eat a greater proportion of vegetables ;—the quantity of food should be much less than is generally taken.

For the *aged*, the quantity of aliment ought to be still more reduced ; but flesh should be the principal constituent.

Females require less food than *men* ; and their diet should be less animalized.

The robust countryman, and the person taking much

exercise in the open air, may take a large proportion of animal food, and eat with impunity substances difficult of digestion. The *merchant or artisan*, especially if inhabiting a large and smoky town, should take less food, and of this vegetables should form the largest proportion. His meals should be more scanty. The *student* should take but a small quantity of aliment, and this must be of easy digestion.

These obvious rules are of course liable to numerous exceptions, founded on peculiarities of constitution and states of disease. To offer more particular directions, would be useless. The condensed view which this Lecture has given, appears amply sufficient for any person, really intent on the regulation of his diet.

Many, I am aware, will disregard the observations, which reprove their habits, reject the advice which urges restraint. "Let the sick study his diet; let the valetudinarian take the advice, for which he pays his fee; don't impose rules on the robust and healthy." But where are the robust and healthy? Do they fill the mill and the counting-house? Is human vigour generated by animal effluvia, or the stench of our manufactures? Is it inspired by an atmosphere dark and polluted? Shall we find full health, the possession of the keen and care-worn sons of traffic, or of men, pale with study and wasted by the energy of the mind? Whom shall we find blessed with an immunity from aches of the head or the stomach? The majority at least of townsmen, I apprehend, are not of this privileged class. Undoubtedly there are *some*, really robust and healthy; and for these, I presume not to offer regula-

tions. I would not intrude on the feast of Sancho, nor give a malediction to the dishes, which a hearty appetite longs to devour. Human life is not burdened with pleasures. Give, then, to the senses, those delights which nature designed. But allow me to remind you, that slight excesses constantly repeated, reduce the best stomach to the debility of the worst; that intemperance in the quantity or quality of the food, materially abridges enjoyment,—first, by gradually diminishing the sensibility of the palate, even to stimuli the most grateful and pungent,—and secondly, by exciting, surely, though slowly, a state of the digestive organs, utterly incompatible with health or comfort.

I cannot conclude this Lecture without a memorial of Stark. Though his experiments are little known, “they may be considered as the corner-stone of a great building, to be finished at some after-period of time, when men shall be found of equal fortitude, perseverance, and self-denial, actuated by a similar zeal for the promoting of useful knowledge.” They were made more than 50 years ago; yet they still stand alone. For seven or eight months, Dr. Stark subjected himself to courses of experiment, which he trusted would elucidate the effects of different kinds of food on the animal economy, and prove, to use his own words, “that a pleasant and varied diet is equally conducive to health, with a more strict and simple one.” At one period, he lived on bread and water; at another, on bread, sugar and water; at a

third, he subsisted on this fluid, with bread and oil of olives ; at another, — with flour and salt ; at another, — with flour and honey.

Not only were varieties of vegetables, but also of animal food, used at distinct periods. The fat of beef, with bread and water was his sustenance at one time ; oil of marrow, with flour, salt and water, at another ; Cheshire cheese, infusion of rosemary and bread, were the last.

The other varieties of diet, I need not detail. His journal presents a simple but affecting picture of the effects of these experiments on their devoted subject. He sometimes suffered from sharp hunger ; for the quantity even of his bread was limited. Nay, when investigating the quantity of perspiration, he subjected himself to long fasting. On one occasion, after complete abstinence the preceding day, he observes, “ From the fifth to the 8th hour after rising, I was very hungry ; I then lost my appetite, became faint, weak, peevish, and lastly fell asleep.” He repeatedly tried, also, the least quantity of liquid, on which he could subsist. Under such courses of mortification, it is not surprising that his body should be reduced, and his constitution sink. On one occasion, he remarks, “ I was so weak and low that I almost fainted in walking across my room ; sick, and my tongue foul ; sore of the mouth in a state of slough, gums black and swollen ; purple spots on the legs.

At another period, when he was taking tallow, “ I lost my appetite,” he naturally observes, “ and was seized with severe headaches, and uneasiness in my stomach and bowels.” At succeeding periods, the train of sufferings increased. I quote the

last minutes he ever wrote. "Feb. 18, I slept pretty well, but when I awoke in the morning, I felt much soreness in my bowels, as if they had been bruised, which made me sigh and groan ; this uneasiness continued after I had got up, and I had little or no appetite for breakfast. I felt universally ill and oppressed, with great uneasiness in my bowels. I was dull, very lazy, often sighed and moaned. Four hours after rising this morning, I breakfasted on bread and infusion of rosemary ; but had no appetite. In eating bread, I found the inside of my mouth a little sore ; two or three small pimples at the corner, and about as many large ones on the body. The uneasiness in my bowels, and universal distress increase when the hurricanes approach, and during their continuance I cannot stir, or even look up. Nothing passes the bowels." The catastrophe was at hand. I need not proceed with the account given by his medical attendants. He died on the 23d, in the 29th year of his age.

Dr. Stark had been unsuccessful in his canvass for the office of Physician to St. George's Hospital, and it appears that other circumstances of chagrin and disappointment had considerably distressed him. "Possessing," says his biographer, Dr. Carmichael Smith, "great firmness and dignity of mind himself, with "uncommon simplicity of manners, he was ill-prepared "for the cold prudence, the time-serving meanness, or "the base duplicity, which he met with in others. He "had not yet learned, in the great school of the world, a "lesson which all young and ingenuous minds receive, at first, with indignation, viz. that genius or

“ talents avail nothing, when opposed to interest or to
“ faction.”

Mental suffering, it appears, diminished the energies which should have resisted disease, but was not the direct cause of death. Stark was a self-devoted victim. We admire the heroism, which history records ; but that of Stark, had a cool energy, an unshaken fortitude, which the warrior and the patriot have rarely exhibited. It led him, not to a sudden sacrifice, but to a series of sufferings. The appetite was put to the severest privations ; bad food and in deficient quantities were long the only sustenance ; and as if to render the cravings of the stomach more urgent and distressing, a warm and invigorating diet was occasionally interposed. Fatal diseases were generated in the constitution ; and the vigour of youth and the powers of the mind, consigned without a murmur to the grave.

Was Stark's course of experiments undertaken as an introduction to practice ? This is not the usual means of obtaining the favour of the public, or the patronage of the great. Was it for Fame ? They were conducted in solitude and almost in obscurity. Perhaps he hoped for ultimate distinction. But he fell in his prime. His very name would have perished with his papers, had not the kindness of the Hon. Thomas Fitzmaurice, after a lapse of 18 years, rescued them from oblivion.

The French eulogise the memory of those, who sacrifice themselves to science and their country : the English respect zeal—when it is discreet and thrifty.

LECTURE III.

DISORDERS OF THE ALIMENTARY CANAL.

THE prosecution of Physiology requires Anatomy, human and comparative,—experiments on the functions in health,—and observations on states of disease. This may be deemed an established truth: but the subject is not generally considered in the extent of its relations, nor has it been practically regarded with adequate zeal.

Anatomy is the lowest grade of the study, the mere vehicle of science,—absolutely necessary, indeed, but no more forming a professional character, than a knowledge of the alphabet constitutes the scholar.

Observations, and especially experiments on animals are highly important, when they fairly interrogate nature, and are conducted by a reflecting and accurate mind. But the deductions of Comparative Physiology, are not always adequate to give complete satisfaction on the doctrines of Human Physiology. They sometimes require collateral observations on Man himself. But these, it is apparent, can rarely be obtained by direct ex-

periment. They must be collected in the rounds of general practice.

Causes, moreover, are sometimes best investigated by examining them in relation to their effects; and the ordinary functions are sometimes best illustrated in the studies of Pathology. Physiology, then, ought not to be an insulated study, either in the sources of its facts, or the application of its doctrines. It should go hand-in-hand with Surgery and Medicine, and accompany the practitioner in his daily routine.

Nor is the subject of less moment in professional education. The Student must not rest in an acquaintance with the individual branches. He must learn to trace their relations,—to deduce his Therapeutic principles from the doctrines of disease,—and these again he must found on the knowledge, which the hand of Anatomy displays, and the mind of Physiology examines, compares, and elaborates.

An acquaintance with the doctrines and descriptions of disease, is also important to the public at large. Independent of its direct advantage, it would act as a preventive of evil, by exposing the folly and danger of universal remedies, and the knavery of those who vend them. That Empiricism should prevail in the ages of ignorance,—and at the dawn of experimental science, when the first chemical professor was the “Prince of Quacks,” and the inventor of the Panacea,—excites no surprise; but that it should be widely diffused in this era, in this land of knowledge, is strange indeed. “There never was a time,” to use the language of a learned and eloquent friend, “when Empiricism met

with higher or more extensive patronage. Is it not supported by the government of the realm, which, sanctioning the practice of the Charlatan, because it produces a petty revenue for the state,—does in fact set a price upon the life of every man, who pays that for his credulity, which he had thought to have paid only for his restoration ?” The evil of Quackery, is no new subject. The regular practitioners have often been loud in their censures. But to denounce knavery, is not to expose it ; and to inveigh against folly, is not the way to correct error. The medical profession must lay aside that appearance of interested feeling, which has led the public to distrust its censures. It must exhibit in a liberal and intelligible manner the causes, the varieties, and the connexions of disease. It is this, and this only, which can effectually check the spread of Empiricism.

In taking a cursory range through the principal disorders of the alimentary canal, it shall be my endeavour to give light and general information, founded on scientific views. I am obliged to omit many subjects, and to touch with a rapid hand most, on which I had wished to enlarge.

There is an unpleasant *error in swallowing*, familiar to most persons, and commonly expressed by the phrase, “the food’s going down the wrong throat.” In perfect deglutition, the respective classes of muscles act in unison ; one set draw up the pharynx, and stretch its mouth ; another close the glottis ;—the ball

of food is thrown backwards by the tongue, and the soft palate raised to the nostrils. These several motions are performed at the same moment. But if the consent of parts be deranged ; if the tongue, instead of contracting on its base, and placing the lid on the glottis, be employed in speech, the aperture for air is not closed, nor is the ball of food thrown sufficiently into the pharynx. It falls, of course, on the top of the air-tube, and a portion enters the glottis. This sensible part is irritated by its improper contents, and nature makes an immediate effort of relief. The lungs are first filled by a deep inspiration ; then forcibly driven upwards by a sudden expiratory effort, and thus a current of air impelled with velocity through the glottis. The muscles also surrounding this aperture, seem to contract in such a manner as to reduce its diameter, and thus by diminishing the canal, augment the momentum of the air it transmits. The assemblage of these actions constitutes a violent cough. The ejection of the foreign body, and the shrill sound which accompanies the effort, are of course produced by the force of the expired air. It is apparent that bodies which from their size can present but a small surface to the current will be more difficult to dislodge than large ones. Thus, as we are often told, Anacreon died by the detention of a Grape-seed. The subject of foreign bodies in the airtube, will be noticed hereafter.

The *Globus Hystericus*, a well-known symptom, is rather a spasmodic action of the gullet and of the muscles moving the pharynx, than a mere detention of flatus, as supposed by the patient. Its common

origin in emotions, I scarcely need mention;—but it would be interesting to ascertain the link, which connects the state of the mind, with the muscular spasm. The impression made on the brain by grief or vexation, probably produces a sympathetic change on the nerves supplying the viscera; the secretions of the digestive apparatus are suddenly altered; gas or depraved juices, instead of the healthy solvents, are thrown into the alimentary canal, producing general irritation; and as irritation in any part of a living canal is often felt solely at its extremity, we here find the most distressing sensation experienced at the top of the gullet, exciting a spasm of the adjacent muscles. The progress of the disorder through the general system, is not within my present scope.

Deglutition is disordered also by inflammation and consequent enlargement of the parts it employs. *Quinsey* or *Sore-throat* is the most frequent of these affections. The pain and difficulty in swallowing are less, when it is seated in the fauces, than when it spreads into the pharynx.

When the tonsils, after an attack of quinsey, remain enlarged, they not only form an impediment to the voice and deglutition, but they become ulcerous, and give a disposition to inflammation on the slightest irritation. Hence the excision of these bodies is sometimes expedient.

Persons often apply handkerchiefs additional, to remove their liability to sore-throat. The practice seems more calculated to give the disposition than prevent it.

Deglutition is sometimes impeded by more permanent disease. The lining of the gullet is occasionally

the seat of excrescences and *Schirrus*. When these so greatly reduce the diameter of the canal, as to prevent the swallowing of requisite food, a hollow elastic tube is passed down the gullet, and nutritious fluids thus injected into the stomach. By this means life has often been maintained for years. Immersion in a bath of milk, has also sometimes afforded a supply to the hungry sufferer.

Deglutition is sometimes impaired or destroyed by *wounds*. In those who cut the throat ineffectually, swallowing is generally impaired for a time.* An interesting case of injury of the throat is related by Baron Larrey. Michel, a private of the French army in Egypt, was shot by a musket-ball, which furrowed the base of his tongue, and carried off the epiglottis. This the patient spit up after the accident, and shewed to the surgeon in attendance. While at rest, he suffered little; but his voice was hoarse and scarcely audible. The attempt to swallow, induced a fit of coughing, so severe as to threaten suffocation. This was repeatedly produced, as the extreme heat of the season, and the irritation of the wound, urged him to drink. Four days spent in this miserable situation, brought on general disorder and great exhaustion. Larrey, when he saw him, on the 5th, introduced into the throat, a tube of elastic gum, through which water and broth were in-

* Some years ago, I attended a man, who, on his apprehension for Felony, divided the Throat with a small table-knife. As the carotids were not injured, the bleeding was soon commanded, and the wound united by lutures. But swallowing was for a time much impeded, the major part of the food escaping by the wound. This was at length torn open by the repetition of the attempt; a new application was consequently required, and a firm binding of the head to the chest. The man ultimately recovered.

jected. By this artificial introduction of food at regular periods, life was preserved. At the end of six weeks, the patient took Panada without a conductor. The first efforts at deglutition were extremely painful, but they became easier in the end; and on his return to France, he was able to swallow Rice, in the form of bullets. His speech, also, though a long time imperfect, was at length restored; for the "conservative power of nature" had expanded the Aretænoid Cartilages* to supply the office of the lost Epiglottis.†

The detention of hard bodies in the Gullet is a frequent and distressing occurrence, and often requires prompt means of relief. If the foreign body be within reach, we draw it upwards by the fingers or curved Forceps; if beyond, we propel it into the stomach by the probang,—a slip of whalebone, padded with sponge at its lower extremity.

We often remark a curious sympathy between the air-tube and the gullet. The distressing sensation is referred to the former, when the

* Two small angular bodies, which flank the Glottis.

† At the defence of the breach of Brihuega, Lord Carpenter was wounded in the mouth by a small Spanish musket-ball, which, carrying before it part of the upper lip, and the teeth of one side, broke and splintered his upper jaw, went through his tongue, and lodged itself near the gullet. The Surgeons supposing it to have been spit out soon after the infliction of the wound, did not deeply examine the parts for nearly a year. "The ledge, which was made upon the bullet by the two fore teeth, lying almost by the gullet, and continually grating upon it, occasioned an intolerable pain, and preventing him from swallowing any thing but liquids, it brought him so low, that his life being despaired of, to make a final trial, his tongue was drawn out as far as it could be, and one of the Surgeons feeling the ball with his probe, which he then took to be a piece of tooth, (several pieces of teeth having been beat into his tongue by the bullet) and endeavouring to extract it, he took hold of the ledge with his forceps, and pulled the ball out, after which he recovered in a few weeks." These statements were given by his brother to the Royal Society; but the Physiologist regrets that a case like this, should not have been fully detailed. Though Deglutition suffered, we are not informed that the voice was injured.

obstruction is really in the latter ; and the sense of suffocation is as great, as if a body actually impeded the passage of air.

At the bottom of the gullet, a peculiar pain is often excited by the passage, or rather the detention, of hard and unbroken food. The pressure on the plexus of the 8th pair of nerves, occasions the irksome feeling.

Immoderate thirst is well-known to be an attendant on fever and some other maladies. But instances are recorded of excessive thirst without obvious disease. In a Parisian Journal are some long details of the life and habits of Catharine Bonsergent, a woman of respectable character, who had been subject from infancy to a burning thirst. When she was weaned, her grandmother caused her to take large draughts of wine. A vomiting of all ingesta succeeded ; and subsequently her thirst seemed established and increased. At the age of three, she drank nearly two pailfuls of water per day ; nor could this excess be prevented by caresses, threats, or the harshest treatment. Years made no change. Yet her health was such as to allow her being a domestic servant. Married at the age of 22, she became the mother of ten children ; but of these, two only were reared. During pregnancy, she often took, according to the statement of her husband and herself, four pailfuls in 24 hours. She never used ardent liquors ; and wine, even in the quantity of a glass, produced a disposition to faint. This case was carefully examined by a deputation from the Philomathic Society. Remaining under the inspection of these gentlemen for ten hours, she

drank in that period, 14 quarts of water. Her urine was fetid, and excessive in quantity ; but she presented no appearance of disease, except eruptions on the under lip.

Equally attested is the case of a labourer, at Woodstone, near Peterborough, who, after an attack of fever, took for many years, and at every season of the year, 4 gallons of fluid in 24 hours. His urine was in proportion to his drink ; but this, as well as the other secretions, appeared to be natural in kind. The man's health was good.

M. Tenon, Professor of Anatomy, adduced the case of an Advocate, who, heated with hunting, fell into a rivulet. To this accident, succeeded a thirst, so great as to oblige him to drink 8—10 quarts daily. At the end of three months, the complaint was removed. In other recorded cases, the quantity of fluid ingesta has been even considerably greater.

The remote cause of this excessive thirst, has not been detected.

Excessive hunger or *voracity* is of more frequent occurrence, than excessive thirst. According to its degree, it may arise from a habit of eating, or from some organic fault in the stomach. Of the first, the instances are familiar. The attention of sensualists is engaged so frequently on the gratification of the appetite, that the faculty of taste is increased, and the stomach habituated to almost incessant action. This organ is therefore disquieted when empty ; an imperious demand is created for frequent meals ; and the epicure degenerates into the glutton. In the absence of active pursuits, of business, and of literature, the thoughts must be occupied

on the senses ; and hence idleness is often the parent of voracity. Dr. Good remarks, that "if a man have nothing to do, he will be almost sure, whenever he has opportunity, to fill up his time by filling up his stomach."

But many instances are on record of voracity much too great, for habits and idleness to produce. Maximin, the Roman Emperor, is stated to have devoured 30—40 pounds of meat in a day. In the Philosophical Transactions, Mortimer relates the case of a boy of the age of 12, who swallowed various articles of food, to the average amount of 64 pounds daily. In this instance, the aliments were rejected soon after they reached the stomach. But in others, an enormous quantity of food has been detained and digested. A French prisoner at Norman Cross, consumed in one day, 16 pounds of raw flesh and 5 bottles of Porter. I will not detail the horrible feasts of another French soldier, Tarare, a vulture, and a cannibal. This wretched being was found after death, to have the stomach and gall-bladder of extraordinary capacity. In both these Frenchmen, perspiration was enormous: and, in them, as well as in the boy, the sleep was uncommonly long and profound. The other functions do not appear to have been unnatural.

In some cases of great voracity, the stomach has been found excessively large ; in some, the Pyloric aperture ; but in others, the position of the organ has favoured the rapid transmission of aliment. It appears, also, that in many instances, the muscular coat is so strongly excited as to propel the food before it undergoes the gastric operation. To the last of these disorders, I have

attributed some cases of inordinate appetite, which have fallen under my own observation.

We occasionally find urgent *cravings* of the stomach, for substances, which neither afford nutriment, correct a morbid state of the digestive fluids, nor supply a defect in the animal economy. Instances are recorded, of insatiable cravings for stones, glass, lead, knives, and money,—for cinders, hair, bits of wood, paper, dirt, and for many substances, much more disgusting.* These perversions are associated with general ill-health, but their immediate cause is not ascertained.

Heartburn is the irritation, I conceive, of depraved Gastric Juice on the nerves of the stomach. The pain has its principal seat at the cardia ; but an annoying sensation is often felt at the top of the gullet. This is an instance of that morbid sympathy, which was mentioned a few pages before. The disease is at the base of the canal, yet an irksome feeling is referred to the summit, while the intermediate space seems unaffected. An acid taste, or eructation, is a frequent concomitant ; and when vomiting succeeds, a quantity of matter as sour as vinegar, is often ejected.† In most cases, general ill-health, or disease of some adjacent organ, gives the predisposition to heart-burn ; and indigestible food, or

* My friend, Dr. Scholefield, informs me that he remembers a boy, about eight years old, who for a trivial inducement, would gnaw human bones, collected from an adjacent church-yard.

† M. Perperes, of Axilles, found, by experiment, that eight ounces of roasted chesnuts, after remaining in the stomach an hour and a half, produced two ounces and 6 drachms of acetous acid. This is stated as an instance of *fermentation*. But I cannot consider it the mere agency of heat and moisture ; for the process would not have been effected in the same period out of the stomach. It was dependent rather on a vital than a chemical power.

emotion, is the excitant. When the attacks occur without obvious cause, serious disease may be suspected in the Pylorus, the Liver, or the Pancreas.

In the first Lecture, I noticed the existence of gas in the alimentary canal. Part is probably taken with the food; and some persons have the power of swallowing air alone.* But independently of air imbibed from the atmosphere, we have reason to believe that gasses, in much larger quantities, are formed in the disordered canal. The secretory vessels of the stomach, or intestines, generate air instead of the digestive fluids, and thus produce flatulence. In illustration of this statement, I may refer to the fact before noticed, that anxiety, alarm, or a fit of passion, suddenly produces, in sensitive persons, the copious evolution of gas. This fact strongly militates against the opinion, generally held by the profession, that flatulent disorders arise from common fermentation.†

Eructation is produced by an inversion of the peristaltic action of the intestines and stomach. A deep inspiration precedes the expulsatory effort;—a full contraction of the abdominal muscles completes it. The anti-peristaltic action is remarkably exhibited in *Rumination*. This process has sometimes oc-

* Gosse, an ingenious Physiologist at Geneva, could thus distend his stomach till vomiting was induced; and this faculty he employed for investigating the phenomena of digestion. Recently, Majendie has found the power of swallowing air much more common than had been previously supposed: 8 or 10 of 100 students were able to effect it. My pupils and myself found this art easily acquired.

† The formation of gas in the stomach is often attributed to the use of green vegetables. On visiting a lady, particularly subject to flatulent indigestion, I found one of her most severe attacks had occurred after eating a supper of animal food. Many such examples might be adduced.

curred in Man. I take an instance from the London Medical Journal, for 1821. A gentleman of studious character, but accustomed to vigorous exercise, was in the habit of taking food in a hasty manner. From this, while he remained in the country, no inconvenience resulted; but on his removal to London, he soon became annoyed with indigestion. After meals, large mouthfuls of fluid, slightly acid, were returned from the stomach, and, in the course of a few years, complete rumination was established. Dr. Copland, on minutely investigating the case, found—that the appetite is always good, though there is little pleasure in eating; and that the food is taken in large mouthfuls, and imperfectly masticated. A quarter of an hour after meals, rumination commences. A slight sense of fullness at the pit of the stomach, leads to a deep inspiration; and at this moment, a bolus of food is rapidly forced up the gullet. It is masticated deliberately and with pleasure, and then returned to the stomach. The balls, sent for rumination, consist chiefly of those aliments, which were least chewed at the first. If rumination be precluded by sleep, or an effort of the will, acid or acrid eructations commonly ensue. The case is well worth reading in detail: it has the scientific investigation, in which similar narratives are defective.*

Sickness at the stomach has not yet been satisfacto-

* Several of those scattered through medical works contain curious facts, but mixed with ludicrous associations and errors. Fabricius ab Aquapend. in speaking of a nobleman, who was the subject of this remarkable process; adds that the father of this individual had a horn growing from his forehead, and intimates that though the son did not inherit the horn of his parent, he possessed in lieu of this bestial appendage, the faculty of chewing his cud! Fabricius also states the

ly explained. Nausea is a depressed state of the gastric nerves; and retching, an effort of the respiratory muscles, which tends to vomiting, but is ineffectual, perhaps, from the want of accordance in the stomach. In the act of vomiting, the Diaphragm descends and is fixed; the abdominal muscles contract fully and suddenly; and with this forcible effort is joined, we believe, a morbid state of the nerves of the stomach, and an inverted action of the muscular coat. But Hunter supposed the stomach passive in the effort of vomiting; and Majendie, from some recent and remarkable experiments, strongly contends for this opinion. Controverted, however, by Portal, and rendered doubtful by many incidental observations, it remains for future research to establish or confute. Vomiting, I conceive, may often depend on a torpor of the gastric absorbents. Vomiting is excited by causes too numerous for detail; but the principal are,—impressions on the stomach itself, and consequent functional* disorder,—organic disease of the stomach, or of some bowel, with which this organ is particularly associated,—impressions on the mind or the brain, and their sympathetic propagation. The

case of a ruminating monk, whose forehead was adorned with two horns! From these cases the learned physician infers as a general remark that ruminating men are horned, and avers that a double stomach, or one like an ox's, will be found on dissection.

* To the general reader it may be necessary to state, that by *functional*, as opposed to *organic*, is meant disease in which there is no change of structure,—neither inflammation nor its effects. Thus vomiting is dependent on *functional* disorder of the stomach, when this cavity is excessively distended or urged by emetics, or when it sympathizes with the injured brain. Vomiting is the result of *organic* disease, when there is inflammation of the stomach, or scirrhus of the pylorus.

The terms, it is convenient to employ, in our present state of knowledge; but they are probably far from correct. We have reason to suspect that disorder never occurs in an organ, without a change of structure.

last of these causes is often overlooked in practice, and the disease consequently left without remedy.

There is an unpleasant affection of the abdomen, which has been recently described by Dr. Bradley, of Huddersfield, under the term of *Stridor Abdominalis*. It is a gurgling or rumbling noise, which arises in some cases, on taking exercise, in others, at particular periods of the day, in many, without evident excitant. The immediate cause is not known. Dr. B. conceives the disorder to be founded on disease of the spine. The cases which I have seen, have occurred in females of delicate frame and reduced health.

Diarrhœa is an increased action of the muscular coat of the intestines, dependent in most cases on an excessive or depraved secretion of the villous. Continued *Diarrhœa* either produces, or is founded on inflammation,* a fact of great importance, yet often overlooked in practice.† The most frequent cause of this disease is the irritation, either of acrid or indigestible substances taken as aliment or medicine, or of depraved secretion, especially faulty bile. The mode in which such agents induce diarrhoea, is sufficiently obvious. But we find other remote causes

* According to Broussais, when *Diarrhœa* or vomiting is accompanied with fever and local pain, there is *acute inflammation* of the mucous membrane of the intestines: when, on the contrary, the constitutional disturbance is slight, the Patient labours under *chronic inflammation*.

† I was lately called to a young Gentleman, who was sinking from continued *Diarrhœa*. For months before, he had been taking strong astringents and a stimulant diet. I immediately instituted a depletory treatment. The Patient soon experienced considerable relief, and even partially acquired appetite and strength. Yet the complaint proved ultimately fatal. On examining the corpse, we found inflammation in the abdomen to an extent, which we had never witnessed before.

more difficult to explain. Impressions on the skin, especially cold, often affect the bowels; and even states of the mind, have a great and sudden influence. Fear is well known to disturb the bowels. Under the impression of pleasing expectation, I have known the bowels become relaxed, and under disappointment, constipated. I was told by an eminent speaker, accustomed regularly to appear in his clerical capacity, that he had always, for some hours before, a slight diarrhœa.

It is of importance to remember, that the large intestines contain not only the refuse of the food, but also the effete parts of the body. When, therefore, there has been any unusual action of the system at large, a waste of the fabric, and a subsequent renovation, the intestines are often the outlet which nature employs. Hence the evacuations are proportioned less to the quantity of the food, than to that of the waste or noxious matter thrown out of the blood.

No medicines are so frequently employed as *purgatives*. In fact, they are the most important and useful. But the professional estimate of their value has been adopted by the public at large, without proper limits and requisite discrimination; and a popular maxim asserts, that "a dose of purging medicine is always safe." When you consider that the extensive class of purgatives contains articles very dissimilar in their operation, and often requiring correctives, combination, or a peculiar management, and that these individual articles are applicable to different states of the alimentary canal, proper for some, and injurious to others,

you will infer that the common notion is erroneous, and sometimes productive of danger. Without medical direction, perhaps no purgative should be taken. The habit, moreover, of frequently exciting the bowels, even with drugs occasionally proper, often lays the foundation for chronic complaints.

Cholera,—vomiting and purging of bilious matter,—is a rapid and dangerous disease. It is founded on a morbid state of the liver, which appears first to be torpid—and subsequently to secrete a large quantity of depraved and acrid bile. This opinion, illustrated so well by Dr. Jas. Johnson, is confirmed by close observation. From the irritation of depraved bile, poured into the intestines, result the violent commotion and inverted action, which characterize the disease. Cramp of the muscles, especially of the legs, is one of the most remarkable symptoms.

Constipation of the Intestines depends on states of the muscular and villous coats, opposite to those which occasion diarrhœa. The debility of the muscular coat has been such as to allow enormous accumulations in the bowels.* From the sympathy between the skin and the intestines, and the vicarious relation of their secretions, sweating or inordinate perspiration may induce costiveness.† A defect in the biliary secretion often gives rise to constipation; but one of the most frequent of the remote causes is the want of sufficient muscular exercise. The constipation of children

* Dr. Good adverts to a fatal case, in which the Colon was found to measure in circumference more than twenty inches. In the collection of Bonetus are many similar relations,

† Willis says, "I have known a great many subject to costiveness, cured by rising an hour sooner than usual in the morning; for by how much the usual perspiration is lessened, by so much the bowels are the more lubricated."

is of more importance than that of adults. A florid look and full appetite, often hide from observation, that torpor of the bowels, which is preparing for the establishment of serious disease.

Colic,—a painful spasm of the intestines,—requires notice, chiefly to point out a circumstance which generally distinguishes it from more dangerous disease of the bowels. Steady pressure with the hand, relieves colic, but aggravates the pain of inflammation. A slight degree of spasmodic pain generally accompanies the want of proper evacuations and the accumulation of flatus ; but the more severe forms of colic, depend on the irritation of some indigestible substance, the passage of gall-stones, or the poison of lead.

Inflammation may affect the peritoneal, the mucous, and, we believe, the muscular coat, of the alimentary canal. In the first Lecture, I showed the difference in the structure of these coats ; and as disease in its symptoms and effects, varies with the texture of disorders, we find a considerable diversity in the progress and character of inflammation as affecting the respective tunics.

A person labouring under *peritoneal inflammation* complains of acute and tensive pain. His abdomen is too tender to bear the pressure of the hand, however gradual ; and sometimes he cannot bear even the weight of the bed-clothes. He lies with his knees bent ; or if he sit, he inclines forwards. The inflammation of the peritoneum, affects moreover the parts it covers or surrounds. Hence the vomiting, or pain at the navel, or irritation of the bladder. But these dis-

orders are less urgent than when the internal organs are themselves inflamed.

The muscular coat seems to be principally and primarily affected in the common "Inflammation of the Bowels" (*Enteritis*).* This disease is characterized by severe and constant pain in the abdomen, chiefly about the navel, with great tenderness on pressure,—obstinate constipation,—and, in the progress of the disease, urgent vomiting. There is commonly a sense of heat in the part; but not often general fever. This disease frequently produces inflammation of the Peritoneum.

Inflammation of the Villous or Mucous Coat, is often discovered after death, when its symptoms had been overlooked in practice; and notwithstanding the recent and extensive labours of the French Pathologists, its diagnostic marks are but partially developed.

According to Broussais, *Inflammation of the Villous Coat of the Stomach* is attended by a deep-seated pain, generally described as hot or burning, not exasperated by *slight* pressure, relieved by cold drinks, but greatly aggravated by ordinary food or warm fluids. Violent vomiting is a general attendant. The countenance is anxious, and the mind greatly depressed. The tongue is often clean and red, but sometimes covered with mucus. There are the usual febrile affections, especially urgent thirst and a hard pulse.† Such are the leading symptoms of the *acute*

* Tacheron considers Enteritis "an inflammation of the mucous membrane, or of all the membranes of the intestines." The subject requires investigation.

† The sense of anxiety and oppression at the stomach often leads the

form of the disease. In the *chronic* form, it is much more insidious. The patient complains of a circumscribed pain, constant, though not generally severe, described as hot, lancinating, or pricking. There is also a sense of obstruction in the stomach. This form of inflammation sometimes occurs after long-continued indigestion.

When Inflammation affects the villous or mucous coat of the *Intestines*, there is griping pain and some tenderness, but little tension. It generally produces Diarrhœa, or Dysentery. Dr. Abercrombie properly remarks, that on this inflammatory state of the mucous membrane are founded the bowel-complaints of infants.

The chief causes of these several kinds of Inflammation, are—substances directly irritating the alimentary canal,—as indigestible or highly-stimulant food,—drastic purgatives,*—various poisons ; agents

Practitioner to administer an emetic. But this practice is condemned not only by a priori reasoning, but by decisive facts. Take a case of Hoffman's. A robust Canon of Halberstad, after a violent fit of passion, drank freely of hot wine. Next day he experienced severe pain and burning at the pit of the stomach, ineffectual retching, anxiety, and a sense of constriction. A Physician administered an antimonial emetic. The Patient vomited three times, but with aggravation of all the symptoms ; and convulsions supervening, he died in ten hours.

Dissection exhibited numerous black and red blotches on the lower parts of the stomach ; in short, inflammation advancing to gangrene,—“so violently had the stomach been compressed and agitated by the effort of vomiting.”

Last year, I was called to a case of inflammation of the stomach, for which a Physician had administered an emetic. The operation of this medicine, though of no uncommon quality or dose, produced a great aggravation of the pain, accompanied with universal agitation, and alarming delirium. After two months of dangerous illness, the Patient slowly recovered.

* Purgatives are very frequently the first remedies administered for Inflammation of the Bowels. From this practice I have seen the worst effects. In true Enteritis it is highly hazardous, and can rarely be useful. The object of purgation is to remove the constipation. But this state is not the cause of the inflammation ; it is merely an effect, and by no means a dangerous effect

acting on parts with which the alimentary canal particularly sympathizes,—as cold* to the skin, especially the feet; the transfer of disease from other parts,—as Gout from the extremities; and disease propagated from adjacent viscera. Inflammation of the bowels is often produced by Hernial Strangulation.†

When Inflammation is not checked or subdued, it produces dropsy, fibrous deposition, ulceration, supuration, or gangrene. *Scirrhus* is a morbid state, supposed to be a result of Inflammation. When it affects the pylorus, this part becomes so thickened as to diminish the aperture for the transmission of food. Hence obstinate vomiting is a regular attendant.

The disorders of the alimentary canal I have hitherto but lightly touched. *Indigestion*, comprising many, often most of these maladies, requires a fuller detail.

It consists in a faulty action, either of the villous coat of the alimentary canal, or of the muscular. The

What is purgation? An increased action of the exhalents, and an increased action of the muscular coat. In Enteritis, the action of the exhalents is suspended, and the muscular coat, we believe, in a state of inflammatory excitement. If, then, the exhalents be urged to pour out fluid, when their mouths are closed by disease,—if the muscular coat be urged to drive hard substances through a canal morbidly sensible,—we must anticipate the aggravation of the disease, or even the induction of gangrene.

For pains in the bowels, cordials are often administered. When the disease is not Colic, but Inflammation, this practice is highly dangerous. Van Swieten states a case, which terminated fatally in eight hours, from the Patient's taking 6 oz. of a spirituous drink.

* It is rather singular, that a draught of cold water, taken when the body is heated, should excite inflammation of the stomach or bowels; but two such instances have fallen under my own notice, and many others are on record.

† Motives of delicacy sometimes prevent patients mentioning this cause of inflammation in the bowels; and if the practitioner neglect to examine, the disease must generally prove fatal. The late Dr. Mossman, of Bradford, told me that he had a record of twenty Enteritic patients, saved by his detecting unsuspected Hernia.

disorder of the villous, (the secreting tunic), by the frequency of its occurrence, and the importance of its relations, claims our attention, to the exclusion of the muscular affection.

Its usual characters will perhaps be best exhibited in a personal narrative. "I suffer," says the Dyspeptic, "almost habitually, from a sensation at the stomach, either of want or oppression. Before dinner, I am faint, or have an irksome craving; after dinner, my food seems to swell,—I am uneasy, and harassed with flatulence. My appetite is irregular, and rarely the proper call of hunger. I am seldom hearty at breakfast, but I often take a full, sometimes an excessive supper. My taste is disagreeable; mouth clammy; and tongue loaded, especially in the morning, with a yellowish or dirty-white fur. The bowels are always confined, unless I take cathartics. The urine is cloudy, and often deposits a brick-red sediment. My skin is either dry, or moistened with partial or disagreeable sweats; it has rarely a warm and universal perspiration. I have often a sensation of heat in the palms, yet I am generally chilly; and my feet I cannot keep warm. My head is dull: there is a constant sense of weight over the eyes, and I have occasionally transient pains in the temples. But what distresses me more than any of these disorders, and indeed more than them all collectively, is debility. Languid, listless, and weary, I am unfit for business, and indisposed for pleasure. I am peevish without provocation, and dejected, I know not why. Were I to take my feelings as evidence, calamity is ever im-

pending." In addition to these symptoms, the practitioner finds the pulse slow and feeble, and the region of the stomach often sensible to the slightest pressure. He remarks the countenance to be shrunk and pale, or of a dingy hue : in the features, gesture, and address, he reads anxiety and melancholy. Such may be

stated as the leading traits, which characterize the more simple forms of indigestion. But we generally find other symptoms superadded. "Heartburn and acid or acrid eructations, destroy my comfort. In the morning, after a constrictive pain at the stomach, a clear fluid rises into the mouth, in large quantity. Under the left breast I have a pain, which is worst when my stomach is particularly disordered, but which is never wholly absent."

An emaciated Dyspeptic complains, "I vomit almost every meal, and often much more than I take ; yet my appetite constantly urges me to eat."

"If," says another, "I take any substance which disagrees with my stomach, I have such severe pain as to draw me double ; a pain, which it would be impossible long to endure, and the very thought of which throws me into a perspiration."

Such descriptions we might render as numerous as the varieties of native constitution, multiplied by the diversities of habits, and states of mind.

Most Liver-complaints are excited by irritation of the villous coat of the stomach or small intestine. Scrophula, in its various forms, depends on indigestion ; Eruptions on the skin, are still more evidently the offspring of this malady ;* diseases of the bones may often be traced to disease in the digest-

ive organs ; Diabetes and other morbid states of the urinary organs, are generally derived from the same source ; and it may even be proved, that some forms of Consumption originate in Indigestion. The

relations of these several states of disease and the rationale of symptoms, characterizing the forms and progress of indigestion, is an important subject, though one which has not, I believe, been fully attempted.*

The state of the digestive organs, as was cursorily noticed in the preceding Lecture, has a considerable influence on happiness and morals. Mental depression and discontent often arise from Dyspepsia. I had almost said, that no man can labour under melancholy, whose digestion is sound and vigorous. Irritability of temper, pettishness, and sullenness, are decidedly bodily disorders, and dependent generally on some fault in the gastric juice or the bile.

When we consider the subjects noticed at the close of the first Lecture,—the sensibility of the digestive organs in general, and of the stomach in particular, their extensive range of sympathies, and their susceptibility of serious impressions from states of the mind, as well as excitants of the body, we shall seek for the remote causes of Indigestion in the habits and relations of society. Let us take a cursory survey of these agents, as they affect persons at different periods of life.

I have before animadverted on the gorging of

* I had drawn up a rather copious statement of what I conceive a plausible theory. But as it embraces a range too wide for my present limits, I must refer it to a treatise, I hope hereafter to publish, on some Diseases of the Stomach and Brain,—their distinctive characters, and their medical treatment.

infants. Their confinement in the smoke of a town, and often too amidst the fumes of noxious minerals, is also to be reprobated. Instead of the healthy repose which results from fresh air and exercise, a dizzy sleep is frequently procured by the unnatural motion of the cradle, or stupefaction induced by narcotic drugs. Under such a system of education, we cannot expect the digestive organs to grow up in health and vigour.

When we examine the treatment of youth, we find that the herding of boys in large schools, where the superintendence is confined to the hours of study, indirectly occasions a state of the nervous system, ultimately productive of obstinate Dyspepsia. With this exception, among the higher classes, we find little to censure. But in the lower, there are great and obvious evils. Crowds of boys and girls are shut in our manufactories, breathing an atmosphere highly impure, from morning to night, and sometimes also from night to morning.* The bad habits also, and vices which result from this system, considerably affect the general health,

* A passage from an able and well-known Author, written in reference to the causes of Consumption, bears equally on the present subject. "The extension of the manufacturing system," says Dr. Armstrong, "has operated morally and physically to the detriment of thousands, however beneficial it may have been to the world at large. The young, the middle-aged, and the old, are commonly crowded together in many of the large manufactories, even without due regard to the distinction of sex, and in the most unwholesome places and employments; and some of them are daily exposed to noxious or irritating inhalations, which must act as direct excitants of consumption, where any latent predisposition lurks. Indeed the general health of this class is continually broken up by the influence of their situation, and by the dissipated, irregular, or unnatural habits which they contract; and hence among them, perhaps more than among any other description of people, are seen the various developments of Scrofula; and Phthisis, of course, has its share of victims. But one of the most melancholy results of the manufacturing system is the cold, calculating selfishness, which it has engendered even in parents, so that they frequently begin to value children as mere labouring animals of interest, almost as soon as

and of course the digestive organs in an especial degree.

When we approach the adult age, the attentive observer, will find various maladies result from the want of marriage. The period of life, from the age of 20 to 40, presents the most numerous causes of Dyspepsia. In addition to the morbid agencies before noticed, especially impurity of the atmosphere, and defect of muscular exercise,—the health of artizans is greatly affected by a confined position of the body, and often also by the qualities of the materials on which they work,—and that of citizens is materially injured by mental excitement and perturbation in one class,—by sensuality and indolence in the other. The effects of vicious indulgence, it is easy to foresee ; but those of mental suffering are not sufficiently observed. Ardent study,* the excitement of the passions, disappointment in love or ambition, the anxiety of mercantile concerns, and grief for failure or loss, are the fruitful sources of disease in the brain and the stomach. All these circumstances directly or indirectly exhaust the vital power ; and digestion, a function especially dependent

they can run about, and accordingly coop them up to earn money by some noisome work, instead of unfolding their affections, and establishing their strength. This is a fertile source both of crime and of disease ; for it is unreasonable to expect, that such children should generally be either virtuous or healthy. Many of them fall prematurely into consumption and similar diseases ; and most of them who survive, have sickly bodies, and depraved minds. It were to be wished, that such cruel sacrifices should cease to be made ; and it is extraordinary, that they should so frequently happen in a country which abounds with more true philanthropy than any other."

* " It is observable," says Tissot, " that fools always eat and drink a great deal, and yet digest perfectly well, even though they lead a sedentary life, and do not surpass others either in the bulk or strength of their bodies, whilst men of genius and abilities, though they have strong muscles, and take exercise sufficient, are obnoxious to crudities in the stomach, and slowness of concoction."

on nervous energy, is generally the first to suffer. But these circumstances are rarely in themselves adequate to the establishment of disease. They are the *remote and predisposing* causes. When we reflect, that all the common excitants of disease affect the body through the medium of the skin, the lungs, or the alimentary canal ; that the first of these structures is generally protected, the second, though exposed to the vicissitudes of the weather, can only suffer at particular times and in particular individuals, while the third is in a state of almost constant excitement, we shall here look for the *exciting* causes of Indigestion. And when we compare the statements in the preceding Lecture with the practices we daily observe, we shall be assured that the disease is elicited by dietetic errors.

Some parts of the treatment requisite for Dyspepsia, may be shortly noticed. After the details in the preceding Lecture, I need not recommend the appropriate diet. My observations, therefore, will principally regard the improvement of habits. Review the circumstances which have been stated as the causes of Indigestion, and you will be convinced that to the cure of the disease, a considerable change is requisite, in the occupations, as well of the mind as the body. The voluptuary, it is obvious, must renounce his vices ; the careworn merchant must fly from his anxieties ; the inmate of the warehouse must have an interval of unpolluted respiration ; the sedentary artizan must devote to exercise and fresh air, a tithe of that time which business is wont to engross ;* the victim of sorrow

* " Want of time " is the common objection made by the industrious

and disappointment must throw his thoughts into a new channel ; the pale and meagre student must forget for a time that there is science to be acquired or glory to be won.

Considerable advantage may be often derived from such games as amuse the mind, without inducing anxiety ; and those should be preferred, which conjoin fresh air and suitable exercise of the muscles. The pleasures of social converse, by diverting the thoughts from corporeal ailments, are of equal utility. Hence the chief advantage of watering places. The variety of company, the new ideas, and the change of habits, are in most cases much more important than the virtues of the spaw.

The studies of literary Dyspeptics require regulation or change. Where inordinate exertion of mind has excited the disorder, and where the character of the man is such, that we can reduce, neither his intentness, nor his hours of application, we should endeavour to substitute lighter for more racking or exhausting pursuits. Poetry, Biography, Antiquities, Natural History, especially those branches which require exercise in the open air, as Botany and Entomology, should take the place of more abstract inquiries.

There are, however, cases for which an opposite treatment is requisite. He, whose complaints are the result of dissipation, must adopt some study or employment, and here endeavour to fix his volatile mind, since regular occupation is

Artizan. With equal propriety he might plead it as a reason for renouncing sleep. But it is obvious, that in both cases, the renovation of strength more than counterbalances the consumption of time. The man who devotes an hour or two to fresh air and exercise, will be able to do more work, than he who sits at his employ from morning to night.

the only means of excluding the temptation to idleness or folly.

Among the circumstances which regard the body in general, clothing is often important. There is a remarkable sympathy between the skin and the stomach. Hence in many individuals, cold applied to the surface will speedily produce disorder of the internal organs. A medical friend stated the case of a man whom he had long treated for indigestion with little advantage. On consulting another practitioner, the patient was only directed to wear stronger shoes and warmer hose. An attention to this simple injunction, prevented any return of the disease. As friction of the skin greatly promotes a free circulation, the Dyspeptic will find advantage from simple rubbing, or the use of the flesh-brush.

Exercise in the open air is essential to the cure of indigestion. On the vigour of the stomach it has a marked and speedy effect ; and this, as much perhaps by an impression on the nervous system, and the consequent improvement of the secretions, as by the force it communicates to the circulation, and the play it gives to the lungs. Exercise should of course be proportionate to the strength of the system. In states of great reduction, the milder kinds only can be borne,—as swinging, sailing on a smooth stream, or the motion of an easy carriage. But for stronger patients, walking or gardening is rather to be chosen. Riding on horseback, I think superior to every other exercise. It is only objectionable, when it allows the feet to become cold. It must of course be accom-

modated to the state of the patient ; but a brisk pace or one which induces free perspiration, is highly advisable, when it does not induce great fatigue. Even hunting is useful to some individuals. In these several modes of exercise, the effect of fresh air is joined to that of muscular labour ; but sometimes we see marked advantage from the latter alone. Faulkner, in one of the Medical Journals, gives a striking example. A young gentleman labouring under Dyspepsia, which no medicines materially relieved, was induced to try the use of the broad sword. He experienced almost immediate advantage, and on continuing the exercise, he found the benefit to be always proportionate to the sweat induced. He completely recovered. Similar advantage would be derived from dancing, practised at proper times, and to a moderate extent.

Bathing is another auxiliary in the cure of Dyspepsia. Immersion in warm water, for half or three-quarters of an hour, relieves the internal organs, by promoting circulation and secretion in the skin. The cold bath is suitable only for convalescents, or those whose digestion has not been long or greatly impaired.

Sleep should be moderate ; from six to eight hours is generally sufficient. Morning slumbers greatly debilitate.

For obstinate Dyspepsia, a change of residence is often advisable. The polluted atmosphere of towns should be exchanged for the pure air of the country, especially mountainous or maritime districts. A voyage promises still greater advantage. The sea-sick-

ness, the changes of atmosphere, climate, habits, and diet, have occasionally effected more than all other remedies.

For the cure, however, of most cases of Indigestion, medical treatment is essential. The detail of remedies and their management, falls not within my present range. Suffice it to observe, that by these, applied with discrimination, energy, and perseverance, a great and often speedy improvement may be made in the state of digestion. If medicine have been reported ineffectual, the fault has been in the reporters ; if Dyspeptic complaints have been said to be incurable, it is because they have not been investigated. I allow considerable difficulty in distinguishing the diseases of the digestive organs, in ascertaining their stages, in the adaptation of remedies, and a difficulty almost as great, in acquiring a command over the patient's habits. But with intentness on the part of the practitioner, and strict obedience on the part of the patient, few, very few cases of Indigestion will be left without relief. It is ignorance and apathy on the one hand, and fickleness and indulgence on the other, which render medicine inefficient.

Let me enter a strong objection to domestic medicines. Laudanum is sometimes used by the Dyspeptic ; and more frequently, Magnesia. To the mischievous effects of the former excessively or ignorantly administered, I need not allude ; but in reference to the latter, generally deemed so harmless, I must state the fact of concretions of this substance having repeatedly proved

fatal to persons who had taken it habitually, and in large quantities.* In the Journal of Science, Mr. Brande refers to a case, "in which not only large quantities of a concretion were voided, but upon examination after death, which took place six months after any Magnesia had been taken, a collection, supposed to be from four to six pounds, was found imbedded in the head of the colon, which was of course much distended."

Chalk is still more pernicious. Bitters, though they sometimes improve the appetite for a time, tend, when long-continued, to weaken digestion. They ought not to be taken without medical direction.

The use of Cordial Tinctures is still more to be reprobated. They produce chronic disease of the liver and of the villous coat of the stomach.

Emetics, though they sometimes afford temporary relief, are seldom of permanent use. They do not, it is obvious, strike at the root of the disease. They neither directly nor indirectly augment the digestive power, or improve the secretions.†

I scarcely need add, that the real remedies are beneficial or injurious, according to their adaptation and management. The Dyspeptic who dabbles in medicine, generally suffers as much from remedies as disease.

* Magnesia administered unnecessarily, can scarcely fail to be injurious. "It removes acidity." But is acidity in every degree an evil? I believe not. A slight degree of it is found in the healthy stomach, from an early period of lactation; and its excess alone, requires such remedies as Magnesia.

† They remind us of the Brush, once "recommended by several eminent Physicians for scouring the Stomach." From Heister's plate, it appears to have resembled the common bottle-brush. "This contrivance was greatly extolled and said to prolong life to a great age, especially if practised once a week, month, or fortnight." But as we should expect, Heister remarks, "that there are very few instances of its happy effects." Nevertheless, the subject of this Instrument and its origin, gave rise to a learned controversy!

Your attention has been repeatedly directed to the high sensibility of the stomach, and its extensive sympathies. You will therefore hear with surprise, the relation of *Wounds* and *Injuries* which it has sustained without the destruction of life, nay even without extreme irritation of the system.

Two negroes were stabbed in the stomach, and though in one case the aperture was such, that some plantains, eaten a short time before, escaped at the wound,—both recovered.

In the Bulletin of the Faculty of Medicine, is detailed the case of a lady who swallowed a silver fork, and recovered after its excision.* In the Biblioth. Med. is stated the case of a melancholic, who believed himself persecuted by a powerful triumvirate. He complained, that three years before, in

* Madame S. to excite vomiting, introduced into the gullet a silver fork, which excited so forcible a contraction in that canal, that it escaped from her hand, and passed into the stomach. Here it remained for three months, without causing any other inconvenience than a sense of weight. At the end of that period, her Physician found it laid across the stomach, with the prongs under the liver. Yet the Lady ate and digested her food as well as before the accident, and her Physician hoped (rather a forlorn hope) that the fork would at length pass by the intestines. About the fifth month, vomiting from indigestion changed its position; and from this time, the Patient became a prey to pains, which threatened a distressing termination. Still, however, the appetite continued good, and the functions of the alimentary canal were regular. At the end of the sixth month, after a second attack of vomiting, external swelling was produced by an extremity of the fork. Motion, or a change of posture, induced great uneasiness, and the Patient consequently was confined to bed. On the 1st of May, (seven months after the accident), the Surgeons determined to lay open the abdomen, and extract the fork from the stomach. Accordingly M. Cayroche performed the operation. No hemorrhage ensued from the wound of the stomach. The fork was extracted with difficulty. It measured $8\frac{1}{2}$ inches by rather more than one. The Lady appears to have suffered little from the operation. She spent the night calmly, and had intervals of sleep. The morning, too, passed without disturbance; but the evening brought symptomatic fever, with great thirst. Bleeding, however, and the ordinary means, allayed the irritation; and no considerable pain or disorder afterwards occurred. On the 6th, she began to take solid food; on the 14th, she came down stairs to dine with her family; on the 20th, the wound was completely healed; and subsequently Madame S. enjoyed the most perfect health.

one of his paroxysms, he had swallowed a fork. The region of the stomach was repeatedly examined, but no foreign body could be felt. Digestion was perfect. At length the man hung himself. On dissection, a varnished fork, with its prongs closely compacted, was found in the stomach. This cavity, as well as the adjacent viscera, were perfectly healthy. Among

the rarities in the Hall of Anatomy at Leyden, was a knife ten inches long, which was cut out of the stomach of a peasant, who lived eight years after the operation.

Still more remarkable is the case, apparently well authenticated, of a man who accidentally swallowed melted lead. He survived two or three days, and after death, the lead was found in the stomach.

The intestines also have been severely wounded without a fatal result.

Wiseman relates the story of a man run through the middle of the abdomen with a rapier. On the following day, his skin was hot, and his pulse a little disturbed, but no considerable suffering ensued, and the man recovered. Arrows have entered the bowels and remained there, without materially affecting either the functions of the canal, or the general health. Deodatus gives the case of a young Weaver stabbed with a small sword, which pierced through the middle of the abdomen, and was broken in the wound. Severe suffering ensued ; but after twelve months, the point of the sword passed the alimentary canal, and the recovery was complete. Instances like these might be multiplied : many are stated or referred to, in Travers' Inquiry into Injuries of the Intestines.

Wounds of the intestines are nevertheless highly dangerous ; yet not, it appears, in the same manner as injuries of the stomach. The sensibility and the sympathy of the intestines are considerably less, and hence the nervous system less frequently receives a deadly shock. The fatal result is usually produced by peritoneal inflammation. A partial division of the intestinal tube, is immediately succeeded by an eversion of the inner coat ; a complete division, by a more complete eversion, and a retraction of the divided extremities of the bowel. Thus the alimentary tube loses its integrity, and the functions of digestion can no longer be performed.

Yet in numerous instances, and probably in those to which I have lately referred, the conservative principle, which resists morbid impressions, and restores deranged functions, has been very strikingly apparent. Life of course depends on the continuity of the alimentary canal ; and nature, either makes an attempt directly to unite the wound, or if this cannot be effected, connects it to the adjacent parts, and forms a sort of embankment, which prevents the extension of injury, and retains the food in its proper canal.

Concretions, particularly described by Dr. Monro, of Edinburgh, induce great irritation, or totally prevent the functions of the alimentary tube. Sometimes, as I before remarked, they are occasioned by the immoderate use of Magnesia ; and sometimes they have been formed on Cherry-stones, or small pieces of Bone, swallowed with the food.

The subject of *Poisons* has of late years received

the attention which it merits. The great work of Orfila is well known ; and valuable facts and observations are frequently seen in the Medical Journals. In the present publication, I shall refer to a few cases which have occurred in my own practice, and offer some brief remarks on the treatment of poisoned persons, which may be useful to the public, as well as the profession.

Arsenic claims our first attention.* How are its baneful effects produced ? Brodie's experiments on brutes, partly answer the question. He found this poison first to affect the nervous system, through the

* To occupy as little space as possible, the principal details are thrown into a note. They are also greatly abridged from the original statements in my case-book.

A man in Nelson-street, who had been drinking for some days, took an ounce of arsenious acid, to be revenged of his wife, who had upbraided him for his intemperance. The poison he mixed in a gill of ale ; drank the major part ; then added some more ale, and swallowed in all, at least 4 drams of the arsenic. This he did at mid-day, in a public-house, and before a number of spectators. " Here goes," said he, " I'm taking a glass of Arsenic !" Supposing him to be in jest, they allowed him to swallow the draught without interruption, but when the fact was believed, they ran for assistance. Half an hour after the poison had been taken, my Pupil, Mr. Corsellis, saw him, and immediately administered strong emetics and diluents in large quantities. On my arrival, shortly afterwards, the man was vomiting freely. His countenance had the appearance of intoxication, and his eyes especially were red and suffused. The pupils were dilated, nor did the light of a candle cause them to contract. The pulse was very quick and weak. There was no anxiety or restlessness, nor did the man make any complaint ; but when questioned, he said that he was racked in every part of his body, especially in the stomach and bowels. Evacuant measures were vigorously pursued. He was incessantly urged to drink and to vomit ; and the quantity of fluid which was ejected from the stomach in the space of an hour, was little less than two gallons. Lime-water and chalk were now assiduously administered ; and about the same time, six or eight pints of water-gruel were forced on the lower bowels. These active measures had a marked effect. In the evening, all urgent symptoms had disappeared, and the man complained only of cramp in the legs. During the second, third, and fourth days, he appeared free from disease, but on the night of the fifth, he became slightly delirious. Next night he was raving. He started from his bed, ran to the window, terrified with imaginary noises in the street. An interval of composure and sleep succeeded ; but in the morning, he was far from tranquil. Opium was largely administered, but neither sleep

medium of the stomach ; 2dly, to derange the action of the heart ; and in the 3d place, to induce inflammation of the stomach or intestines. The first of these operations is sometimes so powerful, as to destroy life at once. M. Chaussier states the case of a man who soon after chewing arsenic, fainted into the arms of death. Such instances, however, are extremely rare. Arsenic, in common with other poisons, is more quickly fatal when applied to wounds, than when taken into the

nor quietude could be procured. The Patient was not indeed outrageous, nor his replies improper ; but he continually imagined angels, old women, and children, flitting around him. The sixth brought no alteration, except that the countenance was rather wild, as if from intoxication, the eyes slightly red, the pupils contracted, and vision indistinct. There was no rise of the pulse, no increased action of the cerebral arteries. In the evening, he bolted out of bed ; constraint therefore became necessary. He lamented his helpless state, and said, " Oh, that I should come to this !" He begged for medicines to procure sleep, a request, unhappily, which was vain ; for narcotics, however varied and combined, appeared wholly useless. Inflammation of the Brain was at length unequivocally presented. He became angry, vindictive, extremely restless, and sometimes so outrageous, that two men were required to guard him ; and although copious bleeding and the application of leeches to the head, gave temporary relief, he expired on the morning of the eighth day from the receipt of the poison.

On dissection of the body, we found the brain in a state of congestion and inflammation ; but the stomach exhibited only some dull red patches, which we considered the remains of past inflammation, and consequently not the immediate cause of death.

The circumstances in this case to which I would particularly advert, are, the large quantity of arsenic taken, the comparative mildness of the early symptoms, the absence of disease for nearly three days, and the inflammation of the brain, which induced the fatal result. In reference to the mildness of the first symptoms, it was probably the consequence of intoxication,—that diminution of the functions, and especially of sensibility, which narcotics occasion. The continued mildness of the symptoms, after the removal of this stupor, could only, I think, be the result of the active means we employed. That inflammation of the stomach was subdued or awarded, is evident from the reports of the second, third, and fourth days, as well as from the dissection after death. The insidious manner in which disease invaded the brain, is an important feature in the case. The only instance I have found of cerebral disease consequent on the taking of arsenic, is in the *Edinb. Journal* for 1819.

One evening, I was called to a woman of respectable character, and sixty-five years of age, who, living unhappily with her son's wife, had taken poison. Expecting my visit, and anxious to complete her purpose, she had left the house, and it was nearly two hours before we found her. She was pale and agitated. With faltering lips, she denied having taken any thing but a dose

stomach. It may also be introduced by the skin. Of this, there are some curious, but not very satisfactory cases on record. Boyle relates the story of a young man, who wore an amulet of arsenic, and who, on overheating himself, suddenly expired. Diemerbroeck refers to cases, in which arsenical amulets, worn as preservatives against the Plague, produced serious disposition : but in most of these instances, it appears that the mineral first acted as a caustic, and after the destruction of the skin, entered by the absorbents.

When a person is suspected of having taken Arsenic, our first attention, it is obvious, must be paid to the evacuation of the stomach. The mineral itself usually produces vomiting ; but this operation is irregular, and does not always ensue so speedily as the patient's safety requires. Hence it is incumbent on the attendants to give a powerful emetic without delay. But if this cannot be immediately procured, large draughts of tepid water or milk and water, limeseed tea, oatmeal-gruel, water sweetened with

of magnesia. We had the means, however, of detecting the lie ; having procured some particles which she had vomited an hour before, and which, thrown on a hot iron, emitted the arsenical odour. Her countenance expressed great distress ; her pulse was excited, and she seemed to suffer pain at the stomach, though she suppressed complaint. At first she refused medicine, but finding us determined to force it, she took several emetic doses and several pints of warm water and gruel, which we urged upon her. Free vomiting was at length induced, and she appeared relieved. Chalk was now largely administered ; about 2 oz. in the space of an hour ; and half a gallon Enema injected. It was eight o'clock when she took the poison, and nearly twelve before the emetic operated. She slept a few hours, and though annoyed with cramp in the legs and some uneasiness in the stomach, she had no severe affection. For some days after, there was a disposition to disorder of the stomach and the head, but this was awarded by common means. Her recovery was speedy and complete ; though she had taken nearly half an ounce of arsenious acid, and three hours elapsed before remedies were administered. On inquiry three months after my attendance, I was informed that she remained in health.

honey, or indeed any diluent and glutinous drink, must be copiously administered. We shall bear in mind, that the danger is proportionate to the concentration of the poison. Many cases have terminated fatally, chiefly, I am convinced, because the evacuant plan has not been carried to a sufficient extent. Too often a pint or a quart of fluid is administered; the unhappy sufferer having vomited a little, begs for repose, and the attendant sits down, contented with having done all which the case admits. But when we examine the alimentary canal after death,—when we see how tenaciously the particles of arsenic adhere to the villous coat,—and how they are concealed in the wrinkles and folds, we cannot but condemn such fatal supineness. Surely to meet the demands of the case, the treatment must be energetic. The patient must be urged, nay compelled to drink; quarts of fluids must be thrown into the canal, and strong emetics repeated, till the stomach be repeatedly emptied. If Emetics do not immediately operate, poison may be drawn from the stomach, by a tube armed with a bag of elastic gum, or still better by a tube and syringe. Attempts should farther be made to render harmless the particles of poison which still remain. With this view, the alkaline sulphurets have been employed, but their effects have not gained the confidence of the Profession. Fatty and oily substances have been used, but they appear to be decidedly injurious.* The chemical agency of lime on arsenic, renders this min-

* By experiments on Dogs, made a few years ago, I found that they increase the activity of the arsenic. Similar observations have been made by others.

eral inert. Hence chalk has been recommended. Mine, I believe, are the first cases in which it has been fairly tried. Its effects are exhibited in the cases I have related. Chalk is a remedy easy for all persons to procure, and safe for all to administer. As soon, therefore, as the alimentary canal is freely evacuated, this substance, to the extent of two or three ounces mixed with water or gruel, must be given in doses of two or three drams every few minutes. Purgatives will afterwards be proper.

The invasion of inflammation must be particularly watched. Pain in the stomach, with tenderness on pressure, calls for prompt and full venesection. A case is related in the *Med. Chir. Trans.* in which this practice was carried to its greatest extent, and with marked success. Nor is the stomach the only organ which demands the vigilance of the medical practitioner. Close observation on the cases which I have seen, leads to the opinion, that the brain and its connections are intimately connected with the fatal result of arsenical poison. Though of high practical importance, the subject is little understood; nor must I here prosecute the discussion.

I remarked, that arsenic in some cases, appears to act solely on the Nervous System. When, therefore, the symptoms are such as indicate depression of the vital powers, unaccompanied by marks of inflammation, stimuli should be administered, perhaps opium, in small doses, and spirits freely.

One important measure in extreme cases, such for instance, as that stated by Chaussier,—is not generally known or remembered, I mean, the maintenance of artificial respiration, after

the apparent extinction of life. If the blood can be decarbonized, the vital powers may still rally, but if respiration be lost, there remains no hope of recovery.*

After the statements on the subject of arsenic, my limits allow me only to advert, very briefly, to the treatment of a few other poisons.

When *Corrosive Sublimate of Mercury* has been taken, we have a powerful antidote in the white of egg. This substance has the property of enveloping the mercury, and rendering it innoxious. White of egg should, therefore, be first administered; and after several doses, the plan, before detailed, of evacuating the alimentary canal, should be fully used. Glutinous drinks and milk, at the temperature of about 80°, are particularly indicated.

If any of the *Mineral Acids* have been swallowed, calcined magnesia, chalk, or soap, must be administered. Water alone, is improper.

For the poison of *Oxalic Acid*, chalk is preferable to magnesia. A solution of common Soap might also be tried. Dr. Scholefield told me the case of a young farmer in the neighbourhood of Easingwold, who having swallowed an ounce of Oxalic Acid in mistake for

* The existence of arsenic in the alimentary canal, is not infrequently an important question in Courts of Justice. The only criterion known is the chemical examination of the matter ejected by vomiting, or of that which remains in the canal. The trial of Angus was referred to in the first Lecture. Our Newspapers of April, 1821, presented the details of a case at York, which excited much interest:—"Was arsenic taken into the stomach or not?" On this question hinged the medical examination.

This trial, like most others of the kind, exhibited the urgent need of Physiological and Pathological knowledge in members of the profession, prior to their giving evidence, which consigns a fellow creature to an ignominious death, or turns loose on society, a wretch deserving of the rack.

The recent work of Paris and Fonblanque on Medical Jurisprudence abounds with interesting and instructive details.

Epsom Salts, was saved by a servant's administering large draughts of Soap-suds.

When *Saltpetre* is taken in mistake for Epsom or Glauber's Salts, violent inflammation of the stomach ensues, and death is a common result. Two cases have occurred in my practice, in one of which, 6 drams, and in another, an ounce was taken; both patients recovered, under the copious administration of diluents.

When a large dose of *Opium*, or other stupifying vegetable, has been taken, we employ strong emetics, and accelerate their operation by tickling the throat with a feather. The sensibility of the stomach, however, is often so greatly reduced by the narcotic, that no vomiting can be induced either by Sulphate of Zinc, or Sulphate of Copper. In such circumstances, dashing cold water over the head and neck, has been employed with advantage. But the first and most promising means is the introduction of the armed tube, or tube and syringe, before mentioned.* The Intestines also require early attention; soap injections should be freely employed. After the eva-

* The bag contains warm water, which the operator's hand throws into the stomach, and on the removal of that pressure, the elasticity of the vessel of course produces a vacuum, and the consequent re-ascent of the fluid. Thus water washes the stomach and is quickly drawn back, with its poisonous contents, through a tube.

The other instrument which has lately attracted so much attention, can be used with more facility and precision. It consists of an elastic tube, connected with a brass syringe. The tube is pushed down the gullet, and the stomach by the action of the syringe, is alternately washed with a pure fluid, and exhausted of its contents. By repetition of the process, in the course of a few minutes, the liquids may be entirely extracted. Care must be taken, however, not to distend the stomach so much, as to force the injurious matter beyond the Pylorus.

This instrument is stated in Johnson's Journal to have been suggested by Monro (secundus,) and first employed with success by Dr. Physick, of Philadelphia: Orfila says, it was proposed by Boerhaave, and brought to perfection by Depuytren and Renault. A recent experiment of Sir A. Cooper's, on a dog, has brought it into general repute.

cuation of the canal, vinegar has often been given with great advantage.

Dr. Perceval, states, in a paper before referred to, that Green Tea and Opium counteract each other. This remark led me to employ Green Tea in the case of a young woman, who in a fit of vexation, had taken an ounce of the Tincture of Opium. After the free evacuation of the stomach, a strong infusion was copiously administered. No dangerous stupor supervened; and the patient's recovery was speedy and complete.





